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The Commonwealth of Massachusetts
DEPARTMENT OF LABOR AND INDUSTRIES
E. LEROY SWEETSER, Commissioner

DIVISION OF STATISTICS
ROSWELL F. PHELPS, Director

LABOR BULLETIN No. 132

(Being Part III of the Annual Report on the Statistics of Labor for 1920)

WAGES AND HOURS OF LABOR IN THE METAL TRADES

IN

MASSACHUSETTS

1914-1919

PUBLIC

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1920

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DEPARTMENT OF LABOR AND INDUSTRIES

E. LEROY SWEETSER, Commissioner

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ROSWELL F. PHELPS, Director

Rooms 463-469, State House, Boston

ORGANIZATION AND FUNCTIONS OF THE DIVISION OF STATISTICS.

In accordance with the provisions of the so-called "Consolidation Act" (Acts, 1919, Chap. 350) certain of the functions of the former Bureau of Statistics were transferred on December 1, 1919, to the new Department of Labor and Industries. The specific provisions in the act having reference to the transfer of these functions appear in Section 69, as follows:

> . . . All the rights, powers, duties and obligations of the said boards, commissions and offices, or of any member or official thereof, and those of the bureau of statistics, or the director thereof, with respect to collecting, arranging and publishing statistical information relative to the commercial and industrial condition of the people, and the productive industries of the commonwealth, usually designated as the statistics of labor and manufactures, and with respect to the establishment and maintenance of public employment offices and with respect to all other matters not otherwise provided for by this act, are hereby transferred to and shall hereafter be exercised and performed by the department of labor and industries, established by this act, which shall be the lawful successor of said boards, commissions, and offices and of said bureau of statistics, and the director thereof, with respect to the said rights, powers, duties and obligations. . . .

The DIVISION OF STATISTICS as now organized consists of four branches as outlined below:

Labor Statistics. Lester E. Archibald, Statistician.
For the collection and tabulation of statistical and other information relating to matters affecting labor and the condition of the working people, as well as questions of general economic and social interest.

Manufactures Statistics. Margaret Shea, Statistician.
For the collection and tabulation of statistics of manufactures and the preparation of an industrial directory.

Library. Helen G. Estey, Librarian.
For the answering of inquiries by members of the Department and the public, relative to the industrial and social welfare of the population.

Public Employment Offices. Roswell F. Phelps, Director.
There are three placement offices, located respectively at:
Boston, 8 Kneeland Street. G. Harry Dunderdale, Superintendent.
Springfield, cor. Water and Worthington Streets. Chester W. Allen, Superintendent.
Worcester, 48-52 Green Street. William A. Wilder, Superintendent.

The labor statistics collected by the Division are published in "Labor Bulletins," which are numbered consecutively as issued, and each number contains matter devoted to one subject. In addition to the Labor Bulletins the division issues quarterly the "Massachusetts Industrial Review" (see cover page 3).

Statistics with reference to manufactures are published annually in a report entitled "Report on the Statistics of Manufactures." A directory of such establishments is also maintained in the office, and this directory is kept up to date by the addition of new establishments and the elimination of those which have gone out of existence.

The administration of the public employment offices and general supervision over the department library are also included as a part of the duties of the Director of the Division of Statistics. A report relative to the activities of these offices is issued annually, and statistical data are published quarterly in the "Massachusetts Industrial Review."

Publication of this Document approved by the Supervisor of Administration.

The Commonwealth of Massachusetts

Department of Labor and Industries

E. LEROY SWEETSER, Commissioner

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WAGES AND HOURS OF LABOR IN THE METAL TRADES IN MASSACHUSETTS, 1914-1919.

I.

INTRODUCTION.

1. SUBJECT-MATTER OF REPORT.

The trend of wages is a subject of widespread interest in the discussion of present-day industrial conditions. In collecting facts for this six-year survey of earnings and hours of labor of wage-earners engaged in the manufacture of metal products in Massachusetts, the Department[1] has sought to show the trend of wages from pre-war levels upwards towards the abnormal heights to which they were forced by recent conditions of war. The notable series of increases in wages, brought out in the present inquiry, reflects very clearly the increased industrial activities that marked the period of the war, which, together with the lack of available labor supply, as was the case during the later years of the war, had such favorable effects on wages. As manifested by the pay-rolls obtained since the armistice was signed and while the more normal conditions of peace time were gradually returning, the course of wages in the industry was still upward.[2] Thus, the limiting influence on wages of a general discontinuance of overtime work in most of the reporting plants after the armistice and the withdrawal of bonuses, made possible largely through war work, appears to have been more than offset by a continued increase in hourly rates of pay.

The metal trades industry was selected as the field for a special survey, not merely because of the great importance of the industry in the State in normal years, but principally because of its unusual importance during the war period. The needs of the recent war made tremendous demands upon Massachusetts industries and upon metal trades industries in particular, and they expanded accordingly. Some of the plants covered by the investigation diverted a large proportion of their resources to government work, while a few devoted their entire capacity to work directly or indirectly traceable to the war. Previous, even, to the participation of this country in the war, the capacity of many plants was taxed by export orders.

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[1] The field work of this investigation and a considerable part of the tabulation of the results were completed prior to the transfer on December 1, 1919, of certain functions of the Massachusetts Bureau of Statistics to the Department of Labor and Industries, by which Department this report is published.

[2] The average earnings of all metal trades workers, male and female, for a pay-roll week in September, 1919, in the 30 representative plants chosen for this study showed an increase of 7.4 per cent over the average earnings for a corresponding week in 1918.

In addition to munitions of war, the products manufactured by the plants furnishing the data published in this report represented some of the principal branches of metal work in the State. In some of the plants, there were relatively few kinds of products manufactured, but these were produced in large quantities, while in others, the finished products were greatly diversified. Among the products manufactured were motor cars, motorcycles, steam pumps, boilers and engines, tanks, valves, motors, electrical apparatus, ignition systems, sheet metal stampings, mechanics' tools, shoe, textile, and paper machinery, forgings, iron, brass, steel, and lead castings, flexible shaftings, oil separators, friction clutches, pulleys, dies, taps, gauges, chains and sprockets, lathes, boring mills, engineering equipment, large pipe fittings, stoves, etc.

As illustrating the importance of foundries and machine shops[1] in the manufacturing field, the following statistics for the year 1918 are quoted from the Annual Report on the Statistics of Manufactures, published by the Massachusetts Bureau of Statistics. In 1918 there were 881 establishments in this group of industries in Massachusetts, with an invested capital of $273,099,011. The value of stock and materials used totaled $141,189,420, while the value of goods produced reached $341,751,367. A more significant measure of importance is found in the value added by manufacture, which amounted to $200,561,947, a figure obtained by deducting the cost of materials and stock used from the gross value of product. In this latter respect the industry ranked second in the State, being outranked only by the cotton goods industry. The amount of wages paid in the industry during the year aggregated $102,246,122, with an average number of 88,599 wage-earners employed, making the per capita yearly earnings of employees, $1,140.27. It has been claimed that more high-grade machinery is manufactured within a radius of 10 miles of Worcester than in any similar area in the world.

One of the practical values of continuous wage statistics, covering a series of years, consists in having the reporting agencies identical for the period studied. In order, therefore, to insure a proper comparison of data, pay-rolls from 30 identical establishments were chosen to form the basis of this report. The pay period selected was the week ending nearest September 30 of each of the six years, 1914 to 1919, inclusive, except when the regularity of employment was interrupted by a strike or by a temporary stoppage of machinery, or by the taking of an inventory or by some other special cause, in which case the pay-rolls were copied for a *normal* week as near the fixed date as possible. In every case, field agents made accurate transcripts of the pay-rolls of each establishment, showing for each employee the occupation, sex, earnings, and hours worked, both in regular time and in overtime, together with any bonuses or premiums paid to employees in those plants in which a bonus system was in operation. Some of the pay-rolls did not show the number of hours worked by employees on piece-work. In such cases, it was necessary for the field agents to consult with care the time cards of such employees or to refer to supplementary time sheets, from which the pay-rolls were prepared.

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[1] In accordance with the Census grouping, this industry includes foundry and machine-shop products; gas machines and gas and water meters; hardware; plumbers' supplies; steam fittings and steam and hot-water heating apparatus; structural ironwork; and, in 1918, ordnance and accessories.

The term "wage-earner," as commonly used, does not include office clerks, stenographers, bookkeepers, superintendents, etc. For this reason, data relative to wages and hours of labor of such employees were omitted. Furthermore, statistics were gathered in the several plants only for those employees who were immediately employed in the manufacture of the products.[1] Accordingly, it has seemed advisable to exclude data relating to the mechanical power, and yard force who are engaged primarily in maintaining in proper working condition the various appliances and machines used in the process of manufacture, in operating the engines which furnish power to the entire plant, and in the transportation of materials and finished products. Stock clerks, storekeepers, packers, box makers, shippers, tool chasers, etc., are not specialized metal workers, and their duties relate for the most part to occupations which are not peculiar to the manufacture of metal products, in that nearly all of these employees could readily transfer from the metal trades to other industries without an essential change of occupation. These occupations, while necessary to the successful operation of the various producing departments of metal trades establishments, do not come within the scope of this inquiry.

The establishments furnishing the data herein discussed are located in 19 different cities and towns in the State. In order to illustrate any variations in local wage conditions which might exist, the statistics for these locations have been broadly grouped geographically, as follows: Northeastern Massachusetts, Southeastern Massachusetts, Suffolk County, Western Massachusetts, and Worcester County.[2]

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[1] For the several years, the number of wage-earners covered by this report constituted approximately 70 per cent of the total number of employees in these establishments.

[2] See Table 7 on page 17.

2. GENERAL SUMMARY OF PRINCIPAL DATA.

The more significant facts brought out by this survey are summarized in the following pages in the form of averages and percentages. In deriving percentages showing the trend of wages, the data for 1914 were taken as the base. It is possible that the selection of figures for 1914 as the base may have slightly exaggerated the course of the average earnings and hours of labor, since employment in the trade in the Fall of that year, just after the outbreak of the world war, was somewhat below normal.

The following table shows for each year the composition of the total labor force in the manufacturing departments of the establishments furnishing the data which formed the statistical basis of this report.

TABLE 1. — *Distribution of Metal Workers in 30 Establishments for a Representative Week in Each Year, 1914–1919.*

YEARS.	Both Sexes	MALES		FEMALES		PERCENTAGE DISTRIBUTION	
		18 years of age and over	Under 18 years of age	18 years of age and over	Under 18 years of age	Males	Females
Total (Six Years).	**[1] 70,077**	**61,749**	**1,259**	**7,013**	**56**	**89.9**	**10.1**
1914,	6,401	5,992	91	317	1	95.0	5.0
1915,	7,531	6,826	162	540	3	92.8	7.2
1916,	12,846	11,728	214	893	11	93.0	7.0
1917,	14,416	12,600	266	1,535	15	89.2	10.8
1918,	15,932	13,274	331	2,307	20	85.4	14.6
1919,	12,951	11,329	195	1,421	6	89.0	11.0

The information for the six years combined represents 70,077 pay-roll records, including those of identical employees from year to year, 98.1 per cent of these records being for males and females 18 years of age and over and 1.9 per cent being for males and females under 18 years of age. To make allowances for whatever depression[2] the lower wages of minors under 18 years of age might cause in the average earnings of adult wage-earners, the data for all employees (males and females) have been tabulated under two age groups, — those 18 years of age and over, and those under 18 years of age.

The difference between average earnings in any year as compared with those for another year is due to several different factors. The effect of a change in hours of labor on compensation is at once apparent. In those years when the market demands created by the war resulted in a considerable amount of overtime work in the industry, the effect of longer working hours on earnings was especially noticeable. The increasing disposition on the part of manufacturers to limit the working hours in a plant to a basic eight-hour day, with an increased rate of pay for overtime work, has had a rather important bearing on earnings. Another factor which had a marked effect on earnings without any direct connection with hours of labor was the payment by some manufacturers of efficiency and service bonuses to their employees.

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[1] This number represents pay-roll records, not individual employees, for the reason that many of the records from year to year are for identical employees.

[2] This depression of average weekly earnings ranged from eight cents in 1914 to 38 cents per week in 1918.

Flat increases in hourly rates have, of course, had an immediate effect on earnings. It should be taken into account, however, that a change from one year to another in the relative skill of the working force, reflecting as it may a preponderance of workers earning a higher or lower rate, has effected an increase or decrease in rates which is more apparent than real. In any statement concerning comparative earnings, it is important to make allowances for all of these elements.

It should be noted that the term "average earnings," as used throughout this report, does not express the average earnings of employees as individuals, but the average earnings for all wage-earners in the selected establishments in a representative week. From general principles, it is clear that the larger the numbers upon which averages are based, the more representative, and therefore the more valuable, is their character.

TABLE 2. — *Average Earnings and Hours of Labor of Metal Workers in a Representative Week in Each Year, 1914–1919.*

Males (18 Years of Age and Over).

YEARS.	Number of Workmen	Average Hours Actually Worked per Week	ACTUAL EARNINGS		PERCENTAGE OF INCREASE EACH YEAR, BASED ON 1914, IN —		
			Average per Hour	Average per Week	Actual Weekly Hours	Earnings per Hour	Earnings per Week
1914, ...	5,992	44.3	$0.276	$12.23	–	–	–
1915, ...	6,826	53.3	.286	15.24	20.3	3.6	24.6
1916, ...	11,728	52.5	.318	16.72	18.5	15.2	36.7
1917, ...	12,600	52.6	.398	20.92	18.7	44.2	71.1
1918, ...	13,274	51.2	.546	27.98	15.6	97.8	128.8
1919, ...	11,329	48.9	.595	29.07	10.4	115.6	137.7

Referring to the above table, it will be observed that the average *weekly earnings* of male employees, 18 years of age and over, rose from $12.23 in the Fall of 1914 to $29.07 for a corresponding week in 1919, or an increase of 137.7 per cent. Between these two extremes there was a variable advance in averages from year to year, the greatest increase over any next preceding year occurring in 1918, when average weekly earnings were one-third higher than the average for the corresponding week in 1917. In the Fall of 1919 the course of earnings was still upward, the increase being 3.9 per cent over the average for 1918.

In 1914, the average *earnings per hour* of all males 18 years of age and over were 27.6 cents; by 1919 they had risen to 59.5 cents. Although the average weekly earnings in 1919 were 137.7 per cent more than they were in 1914, the average actual hourly earnings were but 115.6 per cent greater for the same period. As in the case of weekly earnings the most conspicuous increase in hourly earnings over any next preceding year was revealed in 1918, — hourly earnings in that year being 37.2 per cent higher than in 1917. In 1919, average hourly earnings were nine per cent higher than in 1918.

Average hours actually worked per week fluctuated from a minimum of 44.3 hours in 1914 to a maximum average of 53.3 hours in 1915. For the three years 1915, 1916, and 1917, the relative increase over the year 1914 was practically the same (approximately 18 to 20 per cent). In 1918, the average number of hours began to decline and by 1919 had dropped to 48.9 hours, or but 10.4 per cent higher than the average for the Fall of 1914, when conditions of employment were slightly below normal.

TABLE 3. — *Average Earnings and Hours of Labor of Time-Workers and Piece-Workers, 1914–1919.*

Males (18 Years of Age and Over).

Time-Workers.

YEARS.	Number of Workmen	Average Flat Rate per Hour	ACTUAL EARNINGS		Average Actual Hours of Labor	PERCENTAGE OF INCREASE EACH YEAR, BASED ON 1914, IN —			
			Average per Hour	Average per Week		Flat Rate per Hour	Actual Earnings per Hour	Earnings per Week	Actual Hours of Labor
1914, ...	3,875	$0.257	$0.257	$11.89	46.4	–	–	–	–
1915, ...	4,430	.261	.265	14.46	54.5	1.6	3.1	21.6	17.5
1916, ...	8,151	.287	.298	15.92	53.4	11.7	16.0	33.9	15.1
1917, ...	8,433	.339	.364	19.55	53.7	31.9	41.6	64.4	15.7
1918, ...	9,115	.462	.512	26.55	51.9	79.8	99.2	123.3	11.9
1919, ...	7,310	.526	.550	27.09	49.3	104.7	114.0	127.8	6.3
Piece-Workers.									
1914, ...	1,935	–	[1]$0.308	$13.09	[1]40.4	–	–	–	–
1915, ...	2,046	–	.331	16.91	51.1	–	7.5	29.2	26.5
1916, ...	3,054	–	[1].371	18.83	[1]50.1	–	20.5	43.9	24.0
1917, ...	3,797	–	.475	23.94	50.4	–	54.2	82.9	24.8
1918, ...	3,900	–	.629	31.25	49.7	–	104.2	138.7	23.0
1919, ...	3,855	–	.681	32.86	48.2	–	121.1	151.0	19.3
Piece and Time-Workers.									
1914, ...	182	$0.220	$0.271	$10.30	38.0	–	–	–	–
1915, ...	350	.236	.305	15.42	50.6	7.3	12.5	49.7	33.2
1916, ...	523	.244	.339	16.92	49.9	10.9	25.1	64.3	31.3
1917, ...	370	.291	.418	21.43	51.3	32.3	54.2	108.1	35.0
1918, ...	259	.387	.564	29.11	51.6	75.9	108.1	182.6	35.8
1919, ...	164	.495	.607	28.24	46.5	125.0	124.0	174.2	22.4

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[1] Not including data for 160 piece-workers in 1914 and 185 in 1916, whose hours of labor were not a matter of record.

In the above table, such particulars are presented as may throw light on the comparative wages and hours of labor of male piece-workers and time-workers in the 30 representative establishments. These figures show in a general way that piece-work yielded higher earnings in each of the six years considered than time-work, while the working hours of piece-workers were less. It should not, however, be concluded that for identical work the piece-workers received a higher rate of pay than time-workers. No attempt to secure information concerning this phase of the subject was made in the present inquiry. Time-workers formed each year a majority of the working force of the reporting establishments. A small group of employees was found in each of the six years working at a combination of both time and piece rates. As would be expected, their average rate of earnings was midway between the average for time-workers and that for piece-workers. The table also affords a comparison between average actual hourly earnings, a figure influenced by overtime and bonus earnings, and the average flat rate per hour fixed by manufacturers as payment for time-work. Slight, if any, excess over average flat rates marked the average hourly earnings for the first two years of the period, but, in 1918, the average actual hourly rate of earnings of time-workers was five cents higher than their average flat rate for that year.

Increasing industrial activity, accompanied by a decreasing lack of available workmen which extended over a considerable part of the period studied, made of overtime work a more or less important feature in the trade. In this study the effect of overtime upon earnings is considered, but no attempt was made to treat either of the broad social aspect of the subject or of the economic effect of overtime upon output. The proportion of total weekly earnings of male *time-workers* earned in time outside the scheduled hours that constitute the normal week of a factory increased from 0.7 per cent in 1914 to 19.4 per cent (the highest recorded) in 1918, and then decreased to 8.9 per cent in 1919. The proportion of the total number of male *time-workers* in a representative week who worked overtime in the 30 establishments increased from 5.8 per cent in 1914 to 65.3 per cent in 1918; the percentage then dropped to 39.5 per cent in 1919.[1] Owing to difficulties encountered in determining the amount of piece-work done in overtime hours and the rate of payment therefor, a study of overtime earnings of *piece-workers* was not found feasible.

The amount of earnings accruing from bonuses or premiums for regularity or rapidity of work or for night work constituted a varying proportion of the total earnings of metal workers. The highest percentage for adult males (3.3) was shown for the year 1917 when one-third of the workmen in a representative week received bonus compensation of some kind in addition to their regular weekly wages. The average bonus per man varied from $1.32 per week in 1916 to $2.44 in 1918.[1]

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[1] See Table 10 and discussion on page 22.

The metal trades industry does not ordinarily offer a very large field of employment for female labor. Enough data have, however, been found in the period studied to show some interesting results. Of the 30 reporting establishments, only eight employed women in the manufacturing departments in 1914. This number increased to 15 as the necessity for increasing output of the industry became more urgent at the height of the war. The proportion of women to men employed increased from five per cent in 1914 to a maximum of 14.8 per cent in 1918. By the Fall of 1919, the re-adjustment of industry to a peace-time basis had brought about a reduction in the proportion of women employed to 11.1 per cent of the total manufacturing force. The information for the six years represents 7,069 females.[2] The average earnings of women in 1914 were $7.05; in 1919, the average had increased to $16.65 per week, or 136.2 per cent. The average hourly earnings advanced from 18.3 cents to 37.8 cents, or 106.6 per cent, in the same period. A close correspondence is noted between the percentage increase for 1919 (based on 1914 data) in the average earnings of females 18 years of age and over and males in the same age group, — 136.2 and 137.7 per cent, respectively.

In the data obtained, young persons under 18 years of age were represented in comparatively small numbers. The average weekly earnings of males in this age group ranged from $6.70 in 1914 to $12.83 in 1919, an increase of 91.5 per cent. The range in average weekly earnings of females under 18 years of age was practically the same as that for males. The number of females in this age group is, however, so small that their average earnings may not be entirely representative.

A brief summary of average earnings and hours of labor of males and females, both adult and minor, in 1919, as compared with those for 1914, is arranged in the following comparison.

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[1] See Table 11 on page 24.

[2] Including 56 females under 18 years of age.

Table 4. — *Percentage of Increase or Decrease in Earnings and Hours of Labor of Metal Workers in 1919 over 1914.*

	Number of Employees		Average Weekly Hours of Labor			Average Hourly Earnings			Average Weekly Earnings		
	1914	1919	1914	1919	Per Cent of Increase (+) or Decrease (—)	1914	1919	Per Cent of Increase	1914	1919	Per Cent of Increase
Total.	**6,401**	**12,951**	**44.0**	**48.3**	**+9.8**	**$0.270**	**$0.569**	**110.7**	**$11.89**	**$27.46**	**131.0**
Males, adult, .	5,992	11,329	44.3	48.9	+10.4	.276	.595	115.6	12.23	29.07	137.7
Males, minor, .	91	195	46.1	43.1	—6.5	.146	.297	103.4	6.70	12.83	91.5
Females, adult,	317	1,421	38.5	44.0	+14.3	.183	.378	106.6	7.05	16.65	136.2
Females, minor,	1	6	44.5	45.6	+2.5	.135	.284	110.4	6.01	12.97	115.8

II.

NATURE OF DATA AND METHOD OF PRESENTATION.

1. GENERAL ORGANIZATION OF LABOR FORCE.

A wage-earner in the metal trades is defined as one who performs or helps to perform an operation on metal, whereby its form, size, and qualities are so converted as to render it adaptable for use in industrial, commercial, or other enterprises wherein its properties are useful. With this definition in mind, which is broad enough to include all productive metal trades workers, a classification of the data collected for the report was approached with the idea of so arranging the trades that the scheme would apply, in its essentials, to the many manufacturing establishments engaged in producing a wide variety of metal products. In each manufacturing plant there were processes more or less peculiar to the plant itself, but these peculiarities were applications, with some change, of the basic trades in the metal industry. There are, for general purposes, three principal methods of converting metal from its raw or unfinished state to a finished product ready for industrial or commercial use.

The first method utilizes the malleable properties of metal when it is carefully heated and takes place in the forge shop; the second is the casting of metal from the molten state to desired form and takes place in the foundry; the third involves machining, cutting, trimming, or grinding the rough forgings, castings or stock from the metal market and is performed in the machine shop. To supplement these three essential groups is added a fourth, in order to accommodate those occupations which could not correctly be classified with the first three, because either they were common to all three classes or were found in an altogether separate department. Such group is called "Miscellaneous" and is comprised of employees in assembly, test, inspection, and other departments where special operations are conducted.

Classified thus according to the nature of the work performed, the working units of the various establishments fall into four separate and distinct divisions: Forge shop, Foundry, Machine Shop, and Miscellaneous Departments. Many metal manufacturers operate forge shops and foundries as well as machine shops as part of their manufacturing plants.

Table No. 5 shows the relative importance, as to the number of employees, of each working unit in the 30 plants furnishing data for this study. The largest unit of male wage-earners which included the machine shop operations gave employment to 40.4 per cent of the total working force in the establishments studied for the six-year period taken as a whole. This ratio remained also fairly constant for each separate year of the period. The largest proportion of female wage-earners, ranging from 67.8 per cent in 1916 to 77.3 per cent in 1915, was found among the miscellaneous occupations, which included large numbers of assemblers, inspectors, and winders.

TABLE 5. — *Number and Percentage Distribution of Employees in Blacksmith and Forge Shops, Foundries, Machine Shops and Miscellaneous Departments in 30 Establishments for a Representative Week in Each Year, 1914–1919: By Sex.*

YEARS AND SEX.	Total Number of Employees [All Departments]	BLACKSMITH AND FORGE SHOPS		FOUNDRIES		MACHINE SHOPS		MISCELLANEOUS DEPARTMENTS	
		Number of Employees	Percentage	Number of Employees	Percentage	Number of Employees	Percentage	Number of Employees	Percentage
Total (Six Years).	**[1]70,077**	**1,745**	**2.5**	**13,468**	**19.2**	**26,899**	**38.4**	**27,965**	**39.9**
Males, ...	[1]63,008	1,745	2.8	12,924	20.5	25,430	40.4	22,909	36.3
Females, . . .	[1]7,069	–	–	544	7.7	1,469	20.8	5,056	71.5
1914.	**6,401**	**156**	**2.4**	**1,427**	**22.3**	**2,334**	**36.5**	**2,484**	**38.8**
Males, ...	6,083	156	2.6	1,370	22.5	2,306	37.9	2,251	37.0
Females, . . .	318	–	–	57	17.9	28	8.8	233	73.3
1915.	**7,531**	**193**	**2.6**	**1,415**	**18.8**	**3,210**	**42.6**	**2,713**	**36.0**
Males, ...	6,988	193	2.8	1,354	19.4	3,148	45.0	2,293	32.8
Females, . . .	543	–	–	61	11.2	62	11.5	420	77.3
1916.	**12,846**	**331**	**2.6**	**2,344**	**18.2**	**5,397**	**42.0**	**4,774**	**37.2**
Males, ...	11,942	331	2.8	2,240	18.8	5,210	43.6	4,161	34.8
Females, . . .	904	–	–	104	11.5	187	20.7	613	67.8
1917.	**14,416**	**342**	**2.4**	**2,639**	**18.3**	**5,114**	**35.5**	**6,321**	**43.8**
Males, ...	12,866	342	2.6	2,524	19.6	4,813	37.5	5,187	40.3
Females, . . .	1,550	–	–	115	7.4	301	19.4	1,134	73.2
1918.	**15,932**	**366**	**2.3**	**2,903**	**18.2**	**6,101**	**38.3**	**6,562**	**41.2**
Males, ...	13,605	366	2.7	2,762	20.3	5,498	40.4	4,979	36.6
Females, . . .	2,327	–	–	141	6.1	603	25.9	1,583	68.0
1919.	**12,951**	**357**	**2.8**	**2,740**	**21.1**	**4,743**	**36.6**	**5,111**	**39.5**
Males, ...	11,524	357	3.1	2,674	23.2	4,455	38.7	4,038	35.0
Females, . . .	1,427	–	–	66	4.6	288	20.2	1,073	75.2

[1] This number represents pay-roll records, not individual employees, for the reason that many of the records from year to year are for identical employees.

As all wage-earners fall into two distinct groups when classified with respect to the basic system of wage payment, time and piece, the data for all metal workers have been sub-divided so as to show separately earnings and hours of labor of time-workers, of piece-workers, and of those persons working at both time and piece rates during the week. In 1919, of the total number of metal trades workers (12,951) covered by this investigation, 61 per cent were time-workers, 37.5 per cent were piece-workers, and 1.5 per cent were piece and time-workers, a proportion which was fairly uniform in the five preceding years. The proportion of piece-workers was greater among the women than among the men. In 1919, two-thirds of the women were piece-workers, while only a little more than one-third of the men were working at piece rates.

Included in the group of occupations in the metal trades predominantly time-working are machinists, molders, pattern makers, and boiler makers. The following table shows the composition of the working force in the 30 representative plants, when classified according to the system of payment of wages.

TABLE 6. — *Number and Percentage Distribution of Time-Workers, Piece-Workers, and Piece and Time-Workers in 1914–1919: By Sex.*

	Total Number of Wage-Earners	TIME-WORKERS		PIECE-WORKERS		PIECE AND TIME-WORKERS	
		Number	Percentage	Number	Percentage	Number	Percentage
Both Sexes.							
1914,	6,401	4,001	62.5	2,201	34.4	199	3.1
1915,	7,531	4,638	61.6	2,445	32.5	448	5.9
1916,	12,846	8,561	66.6	3,708	28.9	577	4.5
1917,	14,416	9,097	63.1	4,874	33.8	445	3.1
1918,	15,932	10,707	67.2	4,926	30.9	299	1.9
1919,	12,951	7,903	61.0	4,855	37.5	193	1.5
Males.							
1914,	6,083	3,942	64.8	1,955	32.1	186	3.1
1915,	6,988	4,548	65.1	2,085	29.8	355	5.1
1916,	11,942	8,320	69.7	3,090	25.9	532	4.4
1917,	12,866	8,636	67.1	3,847	29.9	383	3.0
1918,	13,605	9,382	69.0	3,949	29.0	274	2.0
1919,	11,524	7,449	64.6	3,911	34.0	164	1.4
Females.							
1914,	318	59	18.6	246	77.3	13	4.1
1915,	543	90	16.6	360	66.3	93	17.1
1916,	904	241	26.6	618	68.4	45	5.0
1917,	1,550	461	29.7	1,027	66.3	62	4.0
1918,	2,327	1,325	56.9	977	42.0	25	1.1
1919,	1,427	454	31.8	944	66.2	29	2.0

2. GEOGRAPHICAL LOCATION OF ESTABLISHMENTS.

Some measure of the importance of geographical location of factories, as it relates to rates of wages and hours of labor of wage-earners, is afforded by an arrangement of the statistical data under five locality group headings: Northeastern Massachusetts, Southeastern Massachusetts, Suffolk County, Western Massachusetts, and Worcester County. The establishments furnishing the data are quite widely scattered over the State, and the distribution by localities is as follows: Worcester, seven; Boston, four; Brockton and Cambridge, two each; Clinton, Everett, Greenfield, Holyoke, Hudson, Mansfield, Newburyport, Pittsfield, Plymouth, Springfield, Taunton, Walpole, Waltham, Warren, and Westfield, one each. What concentration there is in the field covered is found in Western Massachusetts. In this district were employed practically one-half (49.9 per cent) of the wage-earners in 1919 included in the survey; 14 per cent were found in Suffolk County, and 18.6 per cent in Worcester County.

TABLE 7. — *Number of Metal Workers in 30 Identical Establishments Included in the Report, 1914–1919: By Districts.*

DISTRICTS.	NUMBER OF METAL WORKERS IN 30 ESTABLISHMENTS IN —					
	1914	1915	1916	1917	1918	1919
Both Sexes.						
Northeastern Massachusetts,[1]	154	213	1,120	1,463	2,205	1,137
Southeastern Massachusetts,	437	616	1,080	1,429	1,801	1,134
Suffolk County,[1]	1,069	1,105	2,493	2,068	2,425	1,813
Western Massachusetts,	3,022	3,689	5,896	7,177	7,308	6,462
Worcester County,[2]	1,719	1,908	2,257	2,279	2,193	2,405
Totals,	**6,401**	**7,531**	**12,846**	**14,416**	**15,932**	**12,951**
Males.						
Northeastern Massachusetts,	154	213	1,094	1,432	2,117	1,104
Southeastern Massachusetts,	437	616	1,080	1,325	1,532	1,083
Suffolk County,	1,006	1,040	2,320	1,823	1,766	1,634
Western Massachusetts,	2,785	3,253	5,240	6,071	6,153	5,392
Worcester County,	1,701	1,866	2,208	2,215	2,037	2,311
Totals,	**6,083**	**6,988**	**11,942**	**12,866**	**13,605**	**11,524**
Females.						
Northeastern Massachusetts,	-	-	26	31	88	33
Southeastern Massachusetts,	-	-	-	104	269	51
Suffolk County,	63	65	173	245	659	179
Western Massachusetts,	237	436	656	1,106	1,155	1,070
Worcester County,	18	42	49	64	156	94
Totals,	**318**	**543**	**904**	**1,550**	**2,327**	**1,427**

[1] Information for one plant in this district was not available for the two years 1914 and 1915.

[2] Information for one plant in this district was not available for the year 1914.

By the method of classification of the great body of wage-earners described in the foregoing pages, comparative tables are rendered easy of interpretation. The scheme of distribution can briefly be summarized as follows: First, by geographical location; next by shop department, and the special trades within the respective departments; then by time-workers, piece-workers, and piece and time workers; and finally by sex and age groups.

III.

EARNINGS OF MALE METAL WORKERS 18 YEARS OF AGE AND OVER AS SHOWN BY PAY-ROLLS.

1. INTRODUCTORY.

The statistics of earnings are presented in this report on a weekly and an hourly basis. *Weekly earnings* show the effect of working hours on earnings and have a greater value in throwing light upon the financial resources and spending power of the individual. Low earnings may be due not to low rates, but may show the effect of loss of money to employees from voluntary or enforced idleness during the week. Likewise, high earnings may result not only from high rates of pay, but from gain accruing from work performed in overtime hours or from supplementary bonuses or premiums of different character. The *hourly earnings* afford, however, a basis for more exact wage comparison because of the definite element entailed and are perhaps more satisfactory as an indication of wage trends. The ordinary basis of time payment as shown by the pay-rolls studied is by the hour, and in those cases where the unit of payment was found to be by the day, and in one instance per 100 minutes, rates were reduced to an hourly basis in order to obtain uniformity of measurement.

The question of the form of the rate paid to workmen as compensation on output reduces itself in practice to two fundamental systems, — time-work and piece-work. Occasionally, a workman's earnings during a particular week represent a combination of both time and piece rate payments. The time rates for work are fixed according to more or less well-established precedent, and earnings of this character are commensurate with the time employed. The function of the piece scale is to provide a distinct rate for each variety of product and for each different type of condition under which the product is normally made. As individual effort plays a more or less important part in determining compensation on piece-work, this system affords to the competent worker a greater opportunity to earn considerably more than the worker of average speed or skill.

In this report, all the averages shown are weighted averages. The averages of *weekly earnings* and of *flat hourly rates* are similarly computed by adding the data for each individual employee and dividing the total by the number of employees. The average *actual hourly earnings* were computed, however, by adding the actual weekly earnings of each wage-earner in the group and dividing the resulting total by the sum of the actual hours worked by each person. The *actual* hourly earnings reveal, thus, the influence of any overtime work paid for at higher rates or of premiums of various character which are not directly conditional upon the number of hours worked, and should not be confused with hourly *flat* rates fixed by a manufacturer as payment for given classes of work.

As there are different types of bonuses paid as compensation for extra endeavor on the part of the workmen, so there are also different ways of paying such bonuses. The money is, however, usually distributed as a separate payment from the regular week's earnings and is computed at a specified per cent on the cumulative amount of earnings of a workman during a stated period of time. Sometimes, it is figured on monthly earnings, and then again on a quarterly or a semi-annual basis. In those plants under review where the earnings of employees were found to be subject to bonus remunerations, payable at some time other than the particular week for which pay-rolls were copied, a week's proportionate part of the total bonus was added to each employee's regular week's earnings as shown on the pay-roll. Thus, each worker was credited with his true week's earnings.

2. EARNINGS IN A REPRESENTATIVE WEEK.

Weekly earnings for a pay-roll period in each of the six years considered are briefly summarized in the form of averages in the following table, and the data have been so arranged as to show the proportion of all male metal workers 18 years of age and over in each year whose earnings in a representative week fell within certain specified limits. The average earnings of all male employees in the 30 establishments rose from $12.23 in 1914 to $29.07 in 1919, an increase of 137.7 per cent. The greatest increase in earnings over any next preceding year was found in 1918, when average earnings for that year showed an increase of 33.7 per cent over the average for 1917. The proportion of workmen in the highest wage group ($40 and over) was almost negligible for the first three years considered, but in 1918 approximately 13 per cent of the men were found in this group, a proportion that was practically maintained in 1919. The number of wage-earners falling in the lower wage groups includes not only those employees who work regular hours at comparatively low rates, but also others paid at higher rates and falling in this group because they had worked only part time during the week.

TABLE 8. — *Average Weekly Earnings and Percentage of Male Metal Workers, 18 Years of Age and Over, Earning Specified Amounts in a Representative Week, 1914–1919.*

YEARS.	Total Number of Metal Workers	Average Weekly Earnings	Per Cent Increase in Each Specified Year as compared with Year preceding	PERCENTAGE OF EMPLOYEES EARNING A WEEK —					
				Under $15	$15 and under $20	$20 and under $25	$25 and under $30	$30 and under $40	$40 and over
1914, ...	5,992	$12.23	–	76.7	17.3	4.3	1.2	0.4	0.1
1915, ...	6,826	15.24	24.6	51.1	30.4	12.9	4.1	1.4	0.1
1916, ...	11,728	16.72	9.7	40.9	33.1	17.5	5.4	2.7	0.4
1917, ...	12,600	20.92	25.1	20.1	27.5	26.0	15.4	9.2	1.8
1918, ...	13,274	27.98	33.7	11.2	10.8	18.9	18.4	27.8	12.9
1919, ...	11,329	29.07	3.9	5.4	9.8	22.9	20.0	29.5	12.4

That piece-work has almost invariably yielded higher average earnings than time-work during the period under review is shown, together with the extent of this variation, in the following table. This difference between the average earnings of piece-workers and time-workers in the 30 reporting establishments varied from $1.20 a week in 1914 to $5.77 in 1919.

The average weekly earnings of all time-workers increased 127.8 per cent between 1914 and 1919, as compared with 151 per cent for piece-workers and 174.2 per cent for piece and time-workers for the same period.

Because rates of wages paid in a factory are influenced somewhat by the location of the plant, the data have been grouped under five districts. The greatest increase (148.1 per cent) in average weekly earnings of time-workers between 1914 and 1919 was observed in Western Massachusetts; the highest increase (180.9 per cent) in piece-work earnings for the same period was in Suffolk County. It is significant to note, however, that average earnings in 1914, the basic year, were in both Western Massachusetts and in Suffolk County somewhat below the general average as shown for all establishments in that year.

TABLE 9. — *Average Weekly Earnings of Time-Workers, Piece-Workers, and Piece and Time-Workers, 1914–1919: By Districts.*

DISTRICTS.	TIME-WORKERS		PIECE-WORKERS		PIECE AND TIME-WORKERS		PERCENTAGE OF INCREASE IN WEEKLY EARNINGS EACH YEAR AS COMPARED WITH 1914		
	Number	Average Weekly Earnings	Number	Average Weekly Earnings	Number	Average Weekly Earnings	Time-Workers	Piece-Workers	Piece and Time-Workers
Total: 30 Establishments.									
1914,	3,875	$11.89	1,935	$13.09	182	$10.30	–	–	–
1915,	4,430	14.46	2,046	16.91	350	15.42	21.6	29.2	49.7
1916,	8,151	15.92	3,054	18.83	523	16.92	33.9	43.9	64.3
1917,	8,433	19.55	3,797	23.94	370	21.43	64.4	82.9	108.1
1918,	9,115	26.55	3,900	31.25	259	29.11	123.3	138.7	182.6
1919,	7,310	27.09	3,855	32.86	164	28.24	127.8	151.0	174.2
Northeastern Massachusetts: 6 Establishments.									
1914,	148	13.55	–	–	–	–	–	[1] –	–
1915,	193	15.65	–	–	–	–	15.5	–	–
1916,	1,072	17.18	3	23.47	–	–	26.8	–	–
1917,	1,411	20.93	5	33.69	–	–	54.5	–	–
1918,	1,982	29.03	52	33.65	–	–	114.2	–	–
1919,	1,017	26.95	68	30.14	–	–	98.9	–	–
Southeastern Massachusetts: 6 Establishments.									
1914,	345	12.94	78	13.92	3	18.84	–	–	–
1915,	514	15.23	78	17.86	2	19.65	17.7	28.3	4.3
1916,	890	15.62	141	18.44	3	18.34	20.7	32.5	[2] 2.7
1917,	1,102	16.75	174	22.28	13	22.04	29.4	60.1	17.0
1918,	1,345	26.88	129	27.52	26	28.09	107.7	97.7	49.1
1919,	946	25.81	104	29.66	–	–	99.5	113.1	–
Suffolk County: 4 Establishments.									
1914,	775	11.34	172	10.89	55	10.43	–	–	–
1915,	800	14.71	112	14.28	109	13.96	29.7	31.1	33.8
1916,	1,956	15.66	187	18.49	154	16.24	38.1	69.8	55.7
1917,	1,498	19.73	91	22.79	176	21.58	74.0	109.3	106.9
1918,	1,538	24.31	60	28.09	129	27.90	114.4	157.9	167.5
1919,	1,364	27.46	95	30.59	164	28.24	142.2	180.9	170.8
Western Massachusetts: 5 Establishments.									
1914,	1,302	11.30	1,351	12.28	124	10.04	–	–	–
1915,	1,429	15.70	1,574	16.78	239	16.05	38.9	36.6	59.9
1916,	2,564	16.47	2,352	18.61	302	17.00	45.8	51.5	69.3
1917,	3,272	20.14	2,540	23.78	181	21.23	78.2	93.6	111.5
1918,	3.289	26.76	2,658	32.49	104	30.86	136.8	164.6	207.4
1919,	2,915	28.04	2,405	32.38	–	–	148.1	163.7	–
Worcester County: 9 Establishments.									
1914,	1,305	12.33	334	17.29	–	–	–	–	[1] –
1915,	1,494	12.72	282	18.42	–	–	3.2	6.5	–
1916,	1,669	14.72	371	20.49	64	18.06	19.4	18.5	–
1917,	1,150	18.62	987	24.69	–	–	51.0	42.8	–
1918,	961	23.78	1,001	28.49	–	–	92.9	64.8	–
1919,	1,068	25.26	1,183	34.47	–	–	104.9	99.4	–

[1] There were no basic data for 1914.

[2] Decrease.

A. OVERTIME WORK.

The following table was prepared from a study of the pay-roll data for male *time-workers* in order to show that while basic hours, paid for at straight time rate, decreased during the war period, the proportion of hours worked in overtime at an excess rate of pay increased, which, together with an increase in flat rates and bonus payments, produced the steady upward trend shown in weekly earnings.

The largest amount of overtime work was found in 1918, when nearly two-thirds (65.3 per cent) of the time-workers worked overtime in a representative week and approximately one-fifth (19.4 per cent) of the total weekly earnings was earned at overtime rates. Although the average weekly earnings have increased since the signing of the armistice, the general discontinuance of overtime work and of bonuses is reflected in the figures of the table. Approximately two-fifths (39.5 per cent) of the time-workers employed in the representative plants worked overtime in the Fall of 1919 and the percentage earned by all employees in overtime dropped to 8.9 per cent of their total weekly earnings.

Difficulties in ascertaining the amount of time worked by piece-workers in overtime hours and also the rate of pay for such work made it impracticable to attempt a detailed study of overtime work for piece-workers.

TABLE 10. — *Effect of Overtime Work on Earnings and Hours of Labor of Male Time-Workers in a Representative Week, 1914–1919.*

YEARS.	Number of Time-Workers	ACTUAL WEEKLY EARNINGS				ACTUAL WEEKLY HOURS			Percentage of Time-Workers Working Overtime
		Average	Percentage Earned in Regular Time	Percentage Earned in Overtime	Percentage Earned as Bonus	Average	Percentage Worked in Regular Time	Percentage Worked in Overtime	
30 Establishments.									
1914, ...	3,875	$11.89	99.2	0.7	0.1	46.4	99.4	0.6	5.8
1915, ...	4,430	14.46	94.9	4.7	0.4	54.5	96.1	3.9	25.6
1916, ...	8,151	15.92	91.7	7.3	1.0	53.4	93.7	6.3	39.7
1917, ...	8,433	19.55	84.6	11.6	3.8	53.7	91.4	8.6	44.7
1918, ...	9,115	26.55	77.9	19.4	2.7	51.9	85.8	14.2	65.3
1919, ...	7,310	27.09	90.3	8.9	0.8	49.3	95.8	4.2	39.5

B. BONUS PAYMENTS.

In addition to regular weekly wages, the plan of making wage payments adopted by certain of the manufacturers furnishing information for this report provided for some form of bonus compensation. Bonuses may be grouped under two general headings, — efficiency and service bonuses. In each case, the object of the bonus, frankly admitted, is to encourage added loyalty to the company and to create an extra incentive for efficient work. Straight time-work gives a workman a definite wage, but does not enable him to increase his pay in proportion to increased effort, skill or speed. The bonus study as presented in this report does not include *rate bonuses* which, when occasionally found, were considered and tabulated as part of the regular rate of pay, because workmen were hired with the understanding that their rate should be a definite sum plus a certain per cent.

An efficiency bonus usually affects day-workers and is commonly paid in ratio to the number of pieces produced in excess of a stipulated number. This is sometimes called a "production" bonus. It is not subject to the number of hours worked by an employee, but depends upon his ability to turn out more work than would be required on a straight day basis.

The following is a description of a production bonus plan put into operation by one of the firms covered by this inquiry:

> Under this bonus system, any saving effected in the amount of direct and indirect labor, as compared with a pre-determined amount of production, is shared on what may be called the "50–50 plan" with those employees who have been in the firm's employ for one month or more. There has been worked out as the result of many month's experience a certain percentage which direct and indirect labor should bear in the firm's estimation to a certain quantity of production. If production is increased so that the percentage of direct and indirect labor thereto is decreased as compared with the bogy which the firm is willing to allow, then the difference between the amount actually paid for the production in one month and that which the firm has determined as the estimated amount allowable for such production, is shared 50-50 with the operatives of the particular plant from which the production comes. This is a group arrangement and affects equally all the employees of the plant who have been part of the working force for at least one month. It is claimed by the firm that the operation of this system is simple and that advantages accrue to both the firm and the employees through a substantial increase in earnings to the latter. As part of the scheme there is posted weekly in the plant a chart to indicate by a curved line the status of production, that is to say, whether a bonus is or is not being earned, and if so, the percentage over or under the base or par line.

A service bonus accumulates over a certain period of time and is given for regularity of attendance, promptness, length of time in the employ of a company, consecutive time worked with no lost time, etc. This cash bonus is usually distributed quarterly or semi-annually and is in the form of a specified percentage of earnings of employees, the percentage varying with the length of continuous service of individual employees, — the longer the service the larger the percentage paid. Also, under service bonus may be classed that compensation given to a night worker who is paid a certain per cent of his earnings as a reward for working the night schedule. This sort of bonus depends only indirectly upon the efficiency of the employee and is rather a measure of his attitude toward the company. The statistics of bonuses as given below in tabular form show the degree to which the system affected the earnings of male workers 18 years of age and over, employed in the 30 identical establishments during a representative week in the Fall of each of the six years considered.

TABLE 11. — *Six-Year Comparison of Bonus Payments in a Representative Week.*

YEARS.	Total Number of Workmen	WORKMEN RECEIVING BONUS		BONUS		
		Number	Percentage	Total Amount Earned in One Week	Average Per Man	Percentage of Total Pay-Roll
1914, ...	5,992	48	0.8	$83.67	$1.74	0.1
1915, ...	6,826	274	4.0	394.72	1.44	0.4
1916, ...	11,728	1,207	10.3	1,598.18	1.32	0.8
1917, ...	12,600	4,203	33.3	8,715.59	2.07	3.3
1918, ...	13,274	3,600	27.1	8,766.38	2.44	2.4
1919, ...	11,329	1,455	12.8	2,661.66	1.83	0.8

In 1914, the amount of bonus earned by workmen in a week represented 0.1 per cent of the total payroll for all male employees; in 1915, 0.4 per cent; in 1916, 0.8 per cent; in 1917, it increased to 3.3 per cent; in 1918, 2.4 per cent and in 1919, dropped again to 0.8 per cent. The proportion of workmen earning bonuses in each year was as follows: 0.8 per cent in 1914; 4 per cent in 1915; 10.3 per cent in 1916; 33.3 per cent in 1917; 27.1 per cent in 1918, and 12.8 per cent in 1919.

3. HOURLY EARNINGS.

In the foregoing pages wages have been discussed from a weekly standpoint. With a view to more light upon the subject, a further analysis of the wage data obtained has been made by reducing the weekly earnings of employees to an hourly basis. The average actual hourly earnings presented in Table 12 were obtained by dividing the total actual earnings of each specified group of wage-earners by the total number of hours actually worked by each person in the group.

Average hourly earnings of all male time-workers in the 30 representative plants mounted steadily from 25.7 cents in 1914 to 55 cents in 1919, an increase of 114 per cent; average earnings of piece-workers in the same establishments increased from 30.8 cents an hour to 68.1 cents, or 121.1 per cent, in the same period of time; and average earnings of those employees working both a time and piece schedule rose from 27.1 cents in 1914 to 60.7 cents in 1919, an increase of 124 per cent.

To show what bearing locality had upon average and relative hourly earnings, the statistics have been arranged under five districts. Although the general course of wage rates in the six years showed no very marked divergence in any one district from the general averages for all districts, the table reflects in some measure any purely local wage conditions which existed in the several districts.

TABLE 12. — *Average Hourly Earnings of Time-Workers, Piece-Workers, and Piece and Time-Workers, 1914–1919: By Districts.*

DISTRICTS AND YEARS.	TIME-WORKERS		PIECE-WORKERS		PIECE AND TIME-WORKERS		PERCENTAGE OF INCREASE IN HOURLY EARNINGS EACH YEAR AS COMPARED WITH 1914		
	Number	Average Actual Hourly Earnings	Number	Average Actual Hourly Earnings	Number	Average Actual Hourly Earnings	Time-Workers	Piece-Workers	Piece and Time-Workers
Total: 30 Establishments.									
1914, ...	3,875	$0.257	[1]1,775	$0.308	182	$0.271	–	–	–
1915, ...	4,430	.265	2,046	.331	350	.305	3.1	7.5	12.5
1916, ...	8,151	.298	[1]2,869	.371	523	.339	16.0	20.5	25.1
1917, ...	8,433	.364	3,797	.475	370	.418	41.6	54.2	54.2
1918, ...	9,115	.512	3,900	.629	259	.564	99.2	104.2	108.1
1919, ...	7,310	.550	3,855	.681	164	.607	114.0	121.1	124.0
Northeastern Massachusetts: 6 Establishments.									
1914, ...	148	.299	–	–	–	–	–	[2] –	–
1915, ...	193	.294	–	–	–	–	[3] 1.7	–	–
1916, ...	1,072	.308	3	.476	–	–	3.0	–	–
1917, ...	1,411	.373	5	.717	–	–	24.7	–	–
1918, ...	1,982	.550	52	.790	–	–	83.9	–	–
1919, ...	1,017	.572	68	.659	–	–	91.3	–	–
Southeastern Massachusetts: 6 Establishments.									
1914, ...	345	.279	78	.322	3	.419	–	–	–
1915, ...	514	.280	78	.342	2	.364	.4	6.2	[3] 13.1
1916, ...	890	.293	141	.375	3	.340	5.0	16.5	[3] 18.9
1917, ...	1,102	.325	174	.422	13	.322	16.5	31.1	[3] 23.2
1918, ...	1,345	.537	129	.592	26	.528	92.5	83.9	26.0
1919, ...	946	.545	104	.617	–	–	95.3	91.6	–
Suffolk County: 4 Establishments.									
1914, ...	775	.262	172	.279	55	.253	–	–	–
1915, ...	800	.275	112	.287	109	.260	5.0	2.9	2.8
1916, ...	1,956	.302	187	.374	154	.331	15.3	34.1	30.8
1917, ...	1,498	.369	91	.459	176	.429	40.8	64.5	69.6
1918, ...	1,538	.505	60	.591	129	.587	92.7	111.8	132.0
1919, ...	1,364	.571	95	.692	164	.607	117.9	148.0	139.9

[1] Not including data for 160 piece-workers in 1914 and 185 in 1916, whose hours of labor were not a matter of record.

[2] There were no basic data for 1914.

[3] Decrease.

TABLE 12. — *Average Hourly Earnings of Time-Workers, Piece-Workers, and Piece and Time-Workers, 1914–1919: By Districts* — Concluded.

DISTRICTS AND YEARS.	TIME-WORKERS		PIECE-WORKERS		PIECE AND TIME-WORKERS		PERCENTAGE OF INCREASE IN HOURLY EARNINGS EACH YEAR AS COMPARED WITH 1914		
	Number	Average Actual Hourly Earnings	Number	Average Actual Hourly Earnings	Number	Average Actual Hourly Earnings	Time-Workers	Piece-Workers	Piece and Time-Workers
Western Massachusetts: 5 Establishments.									
1914,	1,302	$0.273	1,351	$0.315	124	$0.277	–	–	–
1915,	1,429	.286	1,574	.327	239	.326	4.8	3.8	17.7
1916,	2,564	.313	2,352	.374	302	.350	14.7	18.7	26.4
1917,	3,272	.385	2,540	.487	181	.416	41.0	54.6	50.2
1918,	3,289	.509	2,658	.659	104	.548	86.4	109.2	97.8
1919,	2,915	.553	2,405	.674	–	–	102.6	114.0	–
Worcester County: 9 Establishments.									
1914,	1,305	.231	[1] 174	.280	–	–	–	–	[2] –
1915,	1,494	.232	282	.368	–	–	0.4	31.4	–
1916,	1,669	.267	[1] 186	.331	64	.311	15.6	18.2	–
1917,	1,150	.327	987	.457	–	–	41.6	63.2	–
1918,	961	.425	1,001	.552	–	–	84.0	97.1	–
1919,	1,068	.501	1,183	.701	–	–	116.9	150.4	–

[1] Not including data for 160 piece-workers in 1914 and 185 in 1916, whose hours of labor were not a matter of record.

[2] There were no basic data for 1914.

The following table shows to what extent the average *actual hourly earnings* of time-workers, influenced as they were by overtime work and bonuses of various types, exceeded the average *flat rates* for a pay-roll period in each of the years studied. The greatest difference occurred in 1918 when overtime earnings, together with premiums, raised the average earnings five cents per hour over the average flat rate schedule for time-workers in the 30 reporting plants.

TABLE 13. — *Comparison of Average Hourly Earnings with Average Flat Rates per Hour of Time-Workers, 1914–1919.*

YEARS.	Number of Time-Workers	Average Flat Rate per Hour	Average Actual Hourly Earnings	Increase per Hour in Actual Earnings over Flat Rates	PERCENTAGE OF INCREASE EACH YEAR AS COMPARED WITH 1914	
					Flat Rate per Hour	Actual Hourly Earnings
30 Establishments.						
1914,	3,875	$0.257	$0.257	–	–	–
1915,	4,430	.261	.265	$0.004	1.6	3.1
1916,	8,151	.287	.298	.011	11.7	16.0
1917,	8,433	.339	.364	.025	31.9	41.6
1918,	9,115	.462	.512	.050	79.8	99.2
1919,	7,310	.526	.550	.024	104.7	114.0

The many processes involved in the manufacture of a variety of metal products have naturally led to the creation of a well-defined classification of occupations in the trade. The data, as taken for six years from the pay-rolls for the producing departments of the 30 plants furnishing information, have been tabulated in detail, showing, for selected occupations representative of the industry, the average earnings in conjunction with average hours actually worked, and may be found on pages 59 to 66. Considered from a numerical point of view, the important occupations peculiar to the metal trades are as follows:[1] Assemblers, bench hands, casting cleaners, drillers, erectors, foundry helpers and laborers, foremen (working), helpers (general), inspectors, lathe hands, machinists (general), milling machine hands, molders, and tool makers. Each of these occupations gave employment to 300 or more metal workers in the group of plants studied in 1918, the year of maximum employment. Over one-half (56.9 per cent) of the male employees 18 years of age and over in the producing departments were found in 1918 in these 14 groups of workers. The three largest groups of occupations are classed under assemblers, lathe hands, and molders.

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[1] For description of occupations see pages 40–55.

IV.

HOURS OF LABOR OF MALE METAL WORKERS 18 YEARS OF AGE AND OVER.

1. INTRODUCTORY.

Closely allied to earnings of wage-earners, and indicative of their real significance, is the length of the working week. In the following pages a summarized statement of the change in hours of labor of metal tradesmen during the six years 1914–1919 in the producing departments of 30 representative establishments is given. The results of the inquiry show an increase in the average number of hours of labor per week in 1915 based on the average for 1914, but a steady diminution during the years 1916 to 1919 when compared with the number in 1915. This gradual reduction in hours during the later years would seem to add special emphasis to the marked upward course of wages in the metal trades industry, already shown in the preceding pages.

It is true that many employees in the industry worked overtime, especially in 1918, but for a large percentage of the workmen the average number of hours worked per week appears to have decreased quite uniformly since 1915. The low average for 1914 may be explained by the fact that in the Fall of that year when the pay-rolls were copied, immediately after the outbreak of the European war, employment conditions in the industry were below normal. The average weekly hours of labor were computed by adding the hours actually worked per week by each workman in the factories, whether he worked full time, overtime or broken time during the week, and dividing the resulting total by the number of workers. Overtime is usually recorded on the factory pay-rolls in the form of additional hours; thus, the pay-roll records show only the total time paid for. In such cases, when overtime work was paid for at other than straight time rates, the number of hours paid for was reduced to the number of hours actually worked by each man.

2. ACTUAL HOURS WORKED IN A REPRESENTATIVE WEEK.

The change in the average and classified weekly hours of labor of wage-earners in six years in the 30 reporting establishments considered as a whole is represented statistically in the following table.

Table 14. — *Average Hours Actually Worked and Percentage of Male Metal Workers, 18 Years of Age and Over, whose Hours of Labor fell within Specified Limits, 1914–1919.*

Years.	Total Number of Work-men	Average Weekly Hours Actually Worked	Percentage of Workmen whose Hours of Labor in a Representative Week were —						
			Under 40	40 and under 48	48	Over 48 and under 54	54	Over 54 and under 60	60 and over
1914, ...	[1] 5,832	44.3	19.9	38.9	0.5	11.6	2.3	25.5	1.3
1915, ...	6,826	53.3	6.4	9.0	2.7	16.9	6.7	43.5	14.8
1916, ...	[1] 11,543	52.5	11.1	8.2	1.9	26.0	9.5	23.1	20.2
1917, ...	12,600	52.6	8.7	11.2	1.8	29.3	7.0	18.9	23.1
1918, ...	13,274	51.2	14.3	10.6	1.7	27.0	4.7	18.0	23.7
1919, ...	11,329	48.9	9.5	19.3	26.6	22.8	3.5	10.4	7.9

[1] Not including data for 160 piece-workers in 1914 and 185 in 1916, whose hours of labor were not a matter of record.

According to the foregoing table, the average working hours in the reporting plants were 44.3 in the Fall of 1914, when business conditions in the industry were at a low ebb. Increased activities in the following year raised the average, however, to 53.3 hours, the highest average reached in the six years considered. Each succeeding year since 1915, with one slight exception, shows a gradual decrease in average hours actually worked, the average for 1919 having dropped to 48.9 hours per week. The number of men in the two lowest hour groups include, obviously, those workmen who lost time during the week through irregularity of employment, either voluntary or enforced. In the higher groups (over 54 hours) are included many wage-earners who worked overtime and also night workers whose schedule of hours is usually longer than that of day workers. Reference to the table shows that for the three years 1916, 1917, and 1918, the greatest concentration of workers (over 25 per cent) is found in the same range of hours (over 48 and under 54).

Average and relative working hours of time-workers, piece-workers, and piece and time-workers are shown in the following table, classified by five districts. The effect of time-work and of piece-work upon the hours of labor of employees thus becomes immediately apparent. In each year, the hours worked by piece-workers are quite uniformly less than those of time-workers.

TABLE 15. — *Average Hours Actually Worked by Time-Workers, Piece-Workers, and Piece and Time-Workers, Classified by Districts, 1914–1919.*

DISTRICTS AND YEARS.	TIME-WORKERS		PIECE-WORKERS		PIECE AND TIME-WORKERS		PERCENTAGE OF INCREASE		
	Number	Average Actual Weekly Hours	Number	Average Actual Weekly Hours	Number	Average Actual Weekly Hours	Time-Workers	Piece-Workers	Piece and Time-Workers
Total: 30 Establishments.									
1914,	3,875	46.4	[1] 1,775	40.4	182	38.0	–	–	–
1915,	4,430	54.5	2,046	51.1	350	50.6	17.5	26.5	33.2
1916,	8,151	53.4	[1] 2,869	50.1	523	49.9	15.1	24.0	31.3
1917,	8,433	53.7	3,797	50.4	370	51.3	15.7	24.8	35.0
1918,	9,115	51.9	3,900	49.7	259	51.6	11.9	23.0	35.8
1919,	7,310	49.3	3,855	48.2	164	46.5	6.3	19.3	22.4
Northeastern Massachusetts: 6 Establishments.									
1914,	148	45.4	–	–	–	–	–	[2] –	–
1915,	193	53.3	–	–	–	–	17.4	–	–
1916,	1,072	55.8	3	49.3	–	–	22.9	–	–
1917,	1,411	56.1	5	47.0	–	–	23.5	–	–
1918,	1,982	52.8	52	42.6	–	–	16.3	–	–
1919,	1,017	47.1	68	45.7	–	–	3.7	–	–
Southeastern Massachusetts: 6 Establishments.									
1914,	345	46.4	78	43.3	3	45.0	–	–	–
1915,	514	54.5	78	52.3	2	54.0	17.5	20.8	20.0
1916,	890	53.3	141	49.1	3	54.0	14.8	13.4	20.0
1917,	1,102	51.5	174	52.8	13	68.4	11.0	21.9	52.0
1918,	1,345	50.1	129	46.5	26	53.2	8.0	7.4	18.2
1919,	946	47.4	104	48.1	–	–	2.2	11.1	–
Suffolk County: 4 Establishments.									
1914,	775	43.3	172	39.0	55	41.3	–	–	–
1915,	800	53.4	112	49.8	109	53.7	23.3	27.7	30.0
1916,	1,956	51.8	187	49.4	154	49.1	19.6	26.7	18.9
1917,	1,498	53.5	91	49.7	176	50.3	23.6	27.4	21.8
1918,	1,538	48.1	60	47.5	129	47.5	11.1	21.8	15.0
1919,	1,364	48.1	95	44.2	164	46.5	11.1	13.3	12.6
Western Massachusetts: 5 Establishments.									
1914,	1,302	41.4	1,351	39.0	124	36.3	–	–	–
1915,	1,429	54.9	1,574	51.3	239	49.2	32.6	31.5	35.5
1916,	2,564	52.6	2,352	49.8	302	48.6	27.1	27.7	33.9
1917,	3,272	52.3	2,540	48.9	181	51.0	26.3	25.4	40.5
1918,	3,289	52.6	2,658	49.3	104	56.3	27.1	26.4	55.1
1919,	2,915	50.7	2,405	48.0	–	–	22.5	23.1	–
Worcester County: 9 Establishments.									
1914,	1,305	53.5	[1] 174	51.3	–	–	–	–	[2] –
1915,	1,494	54.8	282	50.1	–	–	2.4	[3] 2.3	–
1916,	1,669	55.2	[1] 186	55.1	64	58.0	3.2	7.4	–
1917,	1,150	57.0	987	54.0	–	–	6.5	5.2	–
1918,	961	55.9	1,001	51.6	–	–	4.5	0.6	–
1919,	1,068	50.4	1,183	49.2	–	–	[3] 5.8	[3] 4.1	–

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[1] Not including data for 160 piece-workers in 1914 and 185 in 1916, whose hours of labor were not a matter of record.

[2] There were no basic data for 1914.

[3] Decrease.

3. NORMAL WEEKLY WORKING HOURS.

The following table shows the full-time schedule hours of labor, both by the week and by the day, of each of the 30 establishments covered in the survey. These full-time hours do not, of course, indicate the extent in any week of overtime work which is voluntary or virtually so on the part of employees or the degree to which unemployment, either enforced or voluntary, prevails. It represents the required number of hours only in the establishment under normal conditions. Basing the figures on the normal full-time hours of the 30 plants, the report shows that from 1914 to 1919 the average normal hours dropped from 54.9 hours per week to 49.5 hours or 9.8 per cent.

In the Fall of 1919, 18 of the manufacturers were operating their entire factories, or at least one of their producing departments, on a 48-hour work week basis. The working schedule of two plants provided for a 50-hour week and a nine-hour working day, with overtime allowances after eight hours' work. This arrangement would naturally have a favorable bearing on rates of wages because of the increased rate of pay for overtime work which is brought about by this limitation.

TABLE 16. — *Normal Full-Time Working Hours in 30 Establishments — November, 1914 and November, 1919.*

DISTRICTS AND ESTABLISHMENT NUMBERS.	Number of Employees	HOURS OF LABOR — 1914			Number of Employees	HOURS OF LABOR — 1919		
		DAY				DAY		
		Monday to Friday	Saturday	Week		Monday to Friday	Saturday	Week
Northeastern Massachusetts.								
Establishment No. 1,[1]								
Foundry department,	288	9	9	54	264	8	8	48
Machine shop,	531	10	5	55	549	8¾	4¼	48
Establishment No. 2,	42	9	9	54	78	8	8	48
Establishment No. 3,	11	9⅔	5⅔	[2] 54	23	9⅘	5	54
Establishment No. 4,	10	10	5	[2] 55	59	9	5	50
Establishment No. 5,	36	9	9	[2] 54	71	8⅓	6⅓	48
Establishment No. 6,	55	9	9	54	93	8	8	48
Southeastern Massachusetts.								
Establishment No. 7,								
Foundry department,	30	9	9	54	60	8	8	48
Machine shop,	18	10	5	55	75	8⅔	4⅔	48
Establishment No. 8,	38	9	5	50	59	8¾	4¼	48
Establishment No. 9,	15	9	5	[2] 50	19	8½	5½	48
Establishment No. 10,	141	10	5	[2] 55	289	9	5	50
Establishment No. 11,	38	9	9	[2] 54	53	8	8	[3] 48
Establishment No. 12,								
Foundry department,	31	9	9	54	137	8	8	48
Machine shop,	126	10	5	55	442	8	5	45
Suffolk County.								
Establishment No. 13,								
Foundry department,	61	9	9	54	99	8	8	48
Machine shop,	95	10	5	55	206	9	5	50
Establishment No. 14,[1]	194	9¾	5¼	54	229	8⅔	4⅔	48
Establishment No. 15,	80	9¾	5¼	54	134	8⅔	4⅔	48
Establishment No. 16,	833	10	5	55	1,145	8⅗	5	48
Western Massachusetts.								
Establishment No. 17,	256	10	10	60	586	[4] 9	5	50
Establishment No. 18,	74	9½	5	52½	1,132	8¾	4¼	[5] 48
Establishment No. 19,	244	9	9	54	353	9	9	54
Establishment No. 20,	2,007	10	5	55	3,540	[6] 8½	5	[7] 48
Establishment No. 21,	441	10	5	55	851	[4] 9	5	50
Worcester County.								
Establishment No. 22,	43	9⅚	8⅚	58	37	9½	5	52½
Establishment No. 23,	8	10	5	55	15	10	5	55
Establishment No. 24,	[8] 43	10	9	[2] 59	90	10	5	55
Establishment No. 25,	124	10	5	[2] 55	315	9	5	50
Establishment No. 26,	41	10	9	[2] 59	77	10	5	55
Establishment No. 27,	65	10	9	59	32	9	5	50
Establishment No. 28,	33	9	9	[2] 54	46	8	8	48
Establishment No. 29,								
Die shop,	22	9¾	5¼	54	27	9	5	50
Machine shop,	11	10¾	5¼	59	14	9½	5	52½
Establishment No. 30,								
Foundry department,	163	10	5	55	330	8	5	45
Machine shop,	1,209	10	5	55	1,422	9	5	50

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[1] No data relative to regular working schedule of this establishment in 1914 were available; information recorded is as of 1916.

[2] In the Fall of 1914 this plant was operating on a short time schedule; the hours recorded represent the normal hours of the factory.

[3] Fifty-four hours per week are required in a few occupations.

[4] Eight hours represent the basic day upon which a day's pay is fixed, with overtime allowances.

[5] Night schedule, 43½ hours per week.

[6] Nine hours are worked on Monday.

[7] Night schedule, 60 hours per week.

[8] Number of employees taken as of 1915.

V.

EARNINGS AND HOURS OF LABOR OF WOMEN AND YOUNG PERSONS IN THE METAL TRADES.

1. WOMEN.

The proportion of women to men employed in machine shops and foundries has always been small, and the increase in the number of women in 1917 and 1918 over the three preceding years in the manufacturing plants chosen for this survey was largely a matter of adjustment to changed industrial conditions and a labor scarcity brought about by the war. Taking the statistics of 30 representative plants, only eight employed women in their manufacturing departments in 1914, and these eight gave employment to but 317 women. The number of plants employing women increased to 15 during the six years studied. The largest proportion of women as compared to men, was found in 1918, when women wage-earners constituted 14.5 per cent of the total body of workers employed in the group of factories visited. The more normal shop requirements in the industry after the signing of the armistice brought about a reduction in the proportion of women in the Fall of 1919 to 11 per cent of the shop force of the 30 plants aggregated.

The same uninterrupted upward trend in wages which marked the earnings of men in the metal trades industry during the period under discussion appears in a similar degree in the earnings of women in the trade.

Table 17 has been prepared so as to show the classified weekly earnings of women for the six years 1914 to 1919. Reference to the table reveals the fact that the median wage for all women wage-earners in 1914 was under $8; it remained between $8 and $10 for the two years 1915 and 1916 and then advanced to $10 but under $12 in 1917; $12 but under $15 in 1918, and reached $15 but under $20 in 1919. It will be observed that in 1914 all the women in the reporting plants earned less than $12 in a representative week, while in 1919, over four-fifths of the women earned $12 or more a week.

TABLE 17. — *Average Weekly Earnings and Percentage of Women, 18 Years of Age and Over, Earning Specified Amounts in a Representative Week, 1914–1919.*

YEARS.	Total Number of Women	Average Weekly Earnings	PERCENTAGE OF WOMEN EARNING A WEEK —					
			Under $8	$8 and under $10	$10 and under $12	$12 and under $15	$15 and under $20	$20 and over
1914,	317	$7.05	63.4	34.7	1.9	–	–	–
1915,	540	8.81	37.4	27.4	28.2	5.7	1.3	–
1916,	893	9.14	31.1	28.8	28.0	9.6	2.4	0.1
1917,	1,535	11.55	15.6	21.3	17.5	26.9	16.2	2.5
1918,	2,307	13.61	16.5	10.7	17.8	17.8	19.9	17.3
1919,	1,421	16.65	4.8	5.4	7.7	27.8	26.0	28.3

For ready comparison, the statistics of working hours and earnings of women for the six years studied have been reduced to percentages of the average earnings for 1914, and the essential facts are set forth in the accompanying table.

TABLE 18. — *Average Earnings and Hours of Labor of Women Metal Workers in a Representative Week in Each Specified Year.*

Females (18 Years of Age and Over).

YEARS.	Number of Establishments	Number of Metal Workers	Average Hours Actually Worked per Week	ACTUAL EARNINGS		PERCENTAGE OF INCREASE IN EACH YEAR BASED ON 1914 IN —		
				Average per Hour	Average per Week	Actual Hours of Labor per Week	Actual Hourly Earnings	Actual Weekly Earnings
1914,	8	317	38.5	$0.183	$7.05	–	–	–
1915,	8	540	47.5	.186	8.81	23.4	1.6	25.0
1916,	10	893	46.9	.195	9.14	21.8	6.6	29.6
1917,	11	1,535	45.2	.256	11.55	17.4	39.8	63.8
1918,	14	2,307	41.0	.332	13.61	6.5	81.4	93.0
1919,	15	1,421	44.0	.378	16.65	14.3	106.6	136.2

The average earnings of all women metal workers 18 years of age and over, as based on pay-roll information, rose from $7.05 per week in 1914 to $16.65 in 1919, an increase of 136.2 per cent. Average *hourly* earnings, a figure affording, perhaps, because of the definite time factor involved, a more exact indication of wage trends than average *weekly* earnings, increased from 18.3 cents in 1914 to 37.8 cents in 1919, an increase of 106.6 per cent. These rates varied but little for the years 1914, 1915, and 1916. The greatest increase over any next preceding year occurred in 1918, when average hourly earnings increased approximately 30 per cent over the average for 1917.

For many years this State has, by law, restricted the work of women and children in factories and workshops. The provisions of Chapter 113, Section 48, of the Acts of 1919 amended the earlier law, which limited the working hours of women and children under 18 years to 54 a week, so as to prohibit them thereafter from working in factories and certain other establishments for more than nine hours in any one day or for more than 48 hours in a week, except in those establishments where employment is by seasons. In such establishments, the number of hours in any week are specially regulated. In the metal trades establishments furnishing information for this study the average hours actually worked by women fluctuated from 38.5 per week in 1914, when employment conditions in the trade were slightly below normal, to an average of 44 hours in 1919. In 1915, the highest average (47.5) was reached.

In the industry there was a relatively large representation of piece-workers in each of the six years except in 1918, when time-workers constituted a majority (56.7 per cent) of the total number of women employed in the reporting establishments. The classification in the following table differentiates, according to basic system of wage payment, three classes of wage earners: Time-workers, piece-workers, and piece and time-workers.

TABLE 19. — *Average Earnings and Hours of Labor of Women Time-Workers, Piece-Workers, and Piece and Time-Workers, during a Representative Week in Each Specified Year.*

YEARS.	Number of Metal Workers	Average Flat Rate per Hour	ACTUAL EARNINGS		Average Actual Hours of Labor	PERCENTAGE OF INCREASE IN EACH YEAR BASED ON 1914 IN —			
			Average per Hour	Average per Week		Flat Rate per Hour	Actual Hourly Earnings	Weekly Earnings	Actual Hours of Labor
Time-Workers.									
1914, ...	59	$0.140	$0.140	$5.23	37.5	–	–	–	–
1915, ...	89	.152	.153	7.31	47.8	8.6	9.3	39.8	27.5
1916, ...	240	.162	.162	7.80	48.1	15.7	15.7	49.1	28.3
1917, ...	459	.188	.192	8.85	46.2	34.2	37.1	69.2	23.2
1918, ...	1,308	.261	.276	10.73	38.9	86.4	97.1	105.2	3.7
1919, ...	451	.295	.300	13.16	43.8	110.7	114.3	151.6	16.8
Piece-Workers.									
1914, ...	245	–	$0.194	$7.51	38.7	–	–	–	–
1915, ...	358	–	.191	9.05	47.4	–	[1] 1.5	20.5	22.5
1916, ...	609	–	.209	9.69	46.5	–	7.7	29.0	20.2
1917, ...	1,014	–	.289	12.91	44.7	–	49.0	71.9	15.8
1918, ...	974	–	.398	17.36	43.7	–	105.2	131.2	12.9
1919, ...	943	–	.416	18.35	44.1	–	114.4	144.3	14.0
Piece and Time-Workers.									
1914, ...	13	$0.111	$0.166	$6.53	39.4	–	–	–	–
1915, ...	93	.156	.196	9.34	47.6	40.5	18.1	43.0	20.8
1916, ...	44	.115	.195	8.79	45.0	3.6	17.5	34.8	14.2
1917, ...	62	.178	.206	9.26	45.0	60.4	24.1	41.8	14.2
1918, ...	25	.162	.422	18.34	43.5	45.9	154.2	180.9	10.4
1919, ...	27	.288	.343	15.52	45.3	159.5	106.6	137.7	15.0

[1] Decrease.

The average weekly earnings of time-workers increased 151.6 per cent during the period considered, as compared with 144.3 per cent for pieceworkers and 137.7 per cent for piece and time-workers for the same period. As shown in the table, the average actual hourly earnings of time-workers, a figure influenced by bonus earnings and overtime work (commonly paid for at an excess rate) differed but slightly in any year from the average of flat rates fixed by manufacturers as payment for given classes of work.

Women are assigned such tasks in the trade as are suited to their strength and also to their ready dexterity. They may be found engaged not only in inspection, assembling, and light bench work, but also as machine operators, running the lighter types of machines. The following list represents with reasonable fullness the occupations in which women were found employed in the manufacturing plants included in this inquiry: —

- Assemblers.
- Armature winders and inserters.
- Backing-off machine operators.
- Bench hands.
- Boring machine operators.
- Burring machine operators.
- Core cleaners.
- Coremakers.
- Core trimmers.
- Cutting-off machine operators.
- Drillers.
- Enamelers.
- Etchers.
- Filers and fitters.
- Grinders.
- Inspectors.
- Lacquerers.
- Lapping machine operators.
- Lathe operators.
- Machine operators, special.
- Mica workers (electrical specialties).
- Milling machine operators.
- Motor and transformer builders: —
  - Armature connecters.
  - Armature inserters.
  - Armature winders.
  - Field coil winders.
  - Field connecters.
  - Field inserters.
- Nickel platers' helpers.
- Painters.
- Platers.
- Polishers.
- Press operators.
- Profilers.
- Repairers.
- Riveting machine operators.
- Rolling machine operators.
- Saw operators.
- Screw machine operators.
- Slotting machine operators.
- Solderers.
- Stackers.
- Stamping machine operators, metal.
- Straighteners.
- Tapping machine operators.
- Testers.
- Thread mill operators.
- Wire benders.

The data as secured from the pay-rolls for women wage-earners have been classified by selected occupations, and appear on pages 67 to 71. The largest industrial groups are those classified as inspectors, assemblers, winders, drillers, and coremakers. The number of young persons under 18 years of age in the plants visited was so small as not to warrant a detailed tabulation of the earnings and hours of labor for each occupation.

2. YOUNG PERSONS UNDER 18 YEARS OF AGE.

In the data obtained, young persons under 18 years of age were represented in small numbers. The number for 1918 was greater than that for any of the other years of the period studied. In that year 2.2 per cent (331 males and 20 females) of the total shop organization of the establishments visited was composed of workers in this age group. The results of the inquiry in the earnings and hours of labor of this class of wage-earners are briefly summarized in the following table.

TABLE 20. — *Comparative Earnings and Hours of Labor of Male and Female Metal Workers, Under 18 Years of Age, in a Representative Week in Each Specified Year.*

Males (Under 18 Years of Age).

YEARS.	Number of Establishments	Number of Young Persons	Average Hours Actually Worked per Week	ACTUAL EARNINGS		PERCENTAGE OF INCREASE IN EACH YEAR BASED ON 1914 —		
				Average per Hour	Average per Week	Actual Weekly Hours of Labor	Actual Hourly Earnings	Actual Weekly Earnings
1914, ...	15	91	46.1	$0.146	$6.70	–	–	–
1915, ...	16	162	51.1	.135	6.91	10.8	[1]7.5	3.1
1916, ...	18	214	48.9	.159	7.77	6.1	8.9	16.0
1917, ...	26	266	48.0	.189	9.05	4.1	29.4	35.1
1918, ...	22	331	43.7	.287	12.51	[1]5.2	96.6	86.7
1919, ...	16	195	43.1	.297	12.83	[1]6.5	103.4	91.5

Females (Under 18 Years of Age).

YEARS.	Number of Establishments	Number of Young Persons	Average Hours Actually Worked per Week	Average per Hour	Average per Week	Actual Weekly Hours of Labor	Actual Hourly Earnings	Actual Weekly Earnings
1914, ...	1	1	44.5	$0.135	$6.01	–	–	–
1915, ...	2	3	50.7	.133	6.73	13.9	[1]1.5	12.0
1916, ...	2	11	50.3	.174	8.75	13.0	28.9	45.6
1917, ...	2	15	49.3	.207	10.18	10.8	53.3	69.4
1918, ...	5	20	40.3	.292	11.78	[1]9.4	116.3	96.0
1919, ...	2	6	45.6	.284	12.97	2.5	110.4	115.8

[1] Decrease.

The average weekly earnings of males under 18 years of age increased between 1914 and 1919 from $6.70 to $12.83, or 91.5 per cent, while the average hourly earnings which, in 1914 averaged 14.6 cents, reached 29.7 cents in 1919, an increase of 103.4 per cent. In each of the six years, the average earnings of both males and females in this age period show a rather close correspondence in their upward course. The data forming the basis for the average earnings of females were, however, very small, yet they are undoubtedly indicative of the general average in the industry throughout the State.

The following table has been arranged so as to permit a comparison between the earnings and hours of labor of time-workers and of piece-workers, and also with that group of employees who worked both at time and piece rates during the week for which pay-rolls were copied. The wages of time-workers make throughout the six years studied a less favorable showing than those of piece-workers.

TABLE 21. — *Average Earnings and Hours of Labor of Male and Female Metal Workers, Under 18 Years of Age, Classified by Time-Workers, Piece-Workers, and Piece and Time-Workers.*

Males (Under 18 Years of Age).

Time-Workers.

YEARS.	Number of Young Persons	Average Flat Rate per Hour	ACTUAL EARNINGS		Average Actual Hours of Labor	PERCENTAGE OF INCREASE IN EACH YEAR BASED ON 1914 IN —			
			Average per Hour	Average per Week		Flat Rate per Hour	Actual Hourly Earnings	Weekly Earnings	Actual Hours of Labor
1914,	67	$0.138	$0.138	$6.45	46.9	–	–	–	–
1915,	118	.121	.122	6.24	51.2	[1] 12.3	[1] 11.7	[1] 3.3	9.1
1916,	169	.145	.146	7.20	49.1	5.1	5.8	11.6	4.7
1917,	203	.160	.166	8.01	48.2	15.9	20.3	24.2	2.8
1918,	267	.256	.277	12.07	43.6	85.5	100.7	87.1	[1] 7.0
1919,	139	.261	.261	11.29	43.3	89.1	89.1	75.0	[1] 7.7
Piece-Workers.									
1914,	20	–	$0.174	$8.13	46.7	–	–	–	–
1915,	39	–	.172	8.90	51.7	–	[1] 1.1	9.5	10.7
1916,	36	–	.210	10.25	48.7	–	20.7	26.1	4.3
1917,	50	–	.266	13.10	49.2	–	52.9	61.1	5.4
1918,	49	–	.339	14.82	43.8	–	95.4	82.3	[1] 6.2
1919,	56	–	.391	16.65	42.6	–	124.7	104.8	[1] 8.8
Piece and Time-Workers.									
1914,	4	$0.090	$0.137	$3.84	28.0	–	–	–	–
1915,	5	.098	.159	7.01	44.2	8.9	16.1	82.6	57.9
1916,	9	.132	.190	8.67	45.5	46.7	38.6	125.8	62.5
1917,	13	.154	.245	9.87	40.2	71.1	78.8	157.0	43.6
1918,	15	.220	.295	12.86	43.6	144.4	115.3	234.9	55.7
Females (Under 18 Years of Age).[2]									
Time-Workers.									
1915,	1	$0.101	$0.101	$5.50	54.0	–	–	–	–
1916,	1	.125	.125	5.63	45.0	–	–	–	–
1917,	2	.165	.165	8.09	49.0	–	–	–	–
1918,	17	.270	.292	11.65	40.0	–	–	–	–
1919,	3	.243	.245	10.69	43.6	–	–	–	–

[1] Decrease.

[2] There were no data for females under 18 years of age, for 1914, upon which to base percentage of increase for either time-workers or piece and time-workers.

TABLE 21. — *Average Earnings and Hours of Labor of Male and Female Metal Workers, Under 18 Years of Age, Classified by Time-Workers, Piece-Workers, and Piece and Time-Workers* — Concluded.

Females (Under 18 Years of Age) — *Con.*

Piece-Workers.

YEARS.	Number of Young Persons	Average Flat Rate per Hour	ACTUAL EARNINGS		Average Actual Hours of Labor	PERCENTAGE OF INCREASE IN EACH YEAR BASED ON 1914 IN —			
			Average per Hour	Average per Week		Flat Rate per Hour	Actual Hourly Earnings	Weekly Earnings	Actual Hours of Labor
1914, ...	1	–	$0.135	$6.01	44.5	–	–	–	–
1915, ...	2	–	.150	7.35	49.0	–	11.1	22.3	10.1
1916, ...	9	–	.184	9.47	51.5	–	36.3	57.6	15.7
1917, ...	13	–	.213	10.51	49.3	–	57.8	74.8	10.8
1918, ...	3	–	.296	12.54	42.3	–	119.3	108.7	[1] 4.9
1919, ...	1	–	.292	13.71	46.9	–	116.3	128.1	5.3
Piece and Time-Workers.									
1916, ...	1	$0.100	$0.119	$5.37	45.0	–	–	–	–
1919, ...	2	.290	.334	16.04	48.0	–	–	–	–

[1] Decrease.

The proportion of young persons under 18 years of age whose earnings in a representative week fell with certain specified limits is shown in Table 22. The proportion of workers in the highest paid groups is relatively small in each of the six years. In the lowest wage group, under $6, are found not only those wage-earners paid at a comparatively low rate and working the regular customary number of hours in a factory, but also those paid at a higher rate but whose earnings show loss because of part-time employment during the week.

TABLE 22. — *Average Weekly Earnings and Percentage of Young Persons, Under 18 Years of Age, whose Earnings in a Representative Week fell within Specified Limits, 1914–1919.*

Males (Under 18 Years of Age).

YEARS.	Number of Young Persons	Average Weekly Earnings	PERCENTAGE OF EMPLOYEES EARNING A WEEK —						
			Under $6	$6 and under $8	$8 and under $10	$10 and under $12	$12 and under $15	$15 and under $20	$20 and over
1914, ...	91	$6.70	39.5	30.8	16.5	12.1	1.1	–	–
1915, ...	162	6.91	30.2	45.1	16.0	5.6	2.5	0.6	–
1916, ...	214	7.77	29.9	23.4	23.8	15.0	7.0	0.9	–
1917, ...	266	9.05	15.4	33.8	18.0	11.3	13.9	5.3	2.3
1918, ...	331	12.51	10.9	7.9	15.1	15.4	20.5	20.8	9.4
1919, ...	195	12.83	5.7	8.2	17.9	20.0	23.1	15.4	9.7
Females (Under 18 Years of Age).									
1914, ...	1	$6.01	100.0	–	–	–	–	–	–
1915, ...	3	6.73	33.3	33.3	33.4	–	–	–	–
1916, ...	11	8.75	18.2	18.2	36.4	9.0	18.2	–	–
1917, ...	15	10.18	6.7	20.0	20.0	20.0	26.6	6.7	–
1918, ...	20	11.78	15.0	25.0	10.0	10.0	10.0	20.0	10.0
1919, ...	6	12.97	–	–	33.3	–	33.3	33.4	–

VI.

CLASSIFICATIONS AND DESCRIPTION OF OCCUPATIONS.

The following glossary of the fundamental occupations in the metal trades industry includes only those which have been selected as representative of the operating departments of the industry, and while it may not be complete, it will be of service in interpreting the data presented in this report. The glossary is arranged by factory departments and the occupational descriptions are listed thereunder in alphabetical order.

1. BLACKSMITH AND FORGE SHOPS.

For purposes of generalization, the forge shop may be considered as that department of the metal trades industry wherein are carried on, with the aid of mechanical hammering and shaping devices, together with heat agency, processes which convert raw metal into a finished product called forgings. Forge shop operations are dependent upon the malleable properties of certain metals when heated.

The equipment in a forge shop consists essentially of furnaces (especially adapted to the size and shape of the material heated and so designed that a proper temperature can be obtained and maintained without fluctuation), of power hammers, drop forges, and trimming presses. The operations in the shop usually proceed as follows: (1) Raw stock is cut or sawed to approximate sizes; (2) then heated to a malleable temperature; (3) drawn and upset by power hammer; (4) forged to size with drop forge; (5) surplus stock is then trimmed by a cutting press and the forging sent to the hardening and tempering furnaces, should further treatment be necessary.

Annealers, Hardeners, Heat Treaters, and Temperers.

Annealer. — The operator in charge of an annealing furnace is called an annealer. Annealing is the continued heating of metal at some temperature below its melting point, with the object of removing its brittleness and rendering it tough and more or less elastic and resistant to shock. The working of iron and steel, etc., by hammering, bending, rolling, drawing, and similar operations tends to harden them and make them brittle. When this occurs the original properties are restored by annealing. The success of annealing depends upon the judgment and skill of the furnace operator because he places the specified charge of metal in the furnace, regulates the flow and composition of hot gases, and determines when the metal has been uniformly and thoroughly heated. The rate of heating or the bringing of the whole mass evenly up to the proper temperature is very important. Metal can absorb heat at a definite rate. By firing the furnace too hard, the outside of the mass of metal is apt to become overheated, while the center is comparatively cold. Judgment has to be exercised by the operator so as not to raise the temperature of the furnace beyond the proper annealing heat.

Hardener. — A hardener is in charge of a hardening furnace in which metal is heated to a high temperature, then by proper regulation of the cooling process is given the desired degree of hardness. The work is performed in hardening furnaces of various designs. The process of hardening is extensively practised by blacksmiths in making chisels and punches required in their work.

Heat Treater. — A man employed in heating forgings in a process of strengthening and toughening them. Heat treating requires knowledge of the general effect of heat upon metal and ability to perform thereby specialized hardening.

Temperer. — A temperer is employed in tempering metal to a proper degree of hardness and elasticity for use in steel cutting instruments, tools, etc. Tempering is a special kind of hardening and dependent upon the cooling method employed after heating.

The line of demarcation separating each of the foregoing trades is uncertain. In a general sense these terms are nearly interchangeable, but the processes are not confused in the trade, owing to their different technical applications. A hardener can usually anneal and temper, while, conversely, an annealer and a temperer can usually harden, but each must have a knowledge of the physical and chemical properties of metals, a practical knowledge of the heat treatment of different types of metals and an understanding of the use of air, water, or oil as a quenching medium, and should understand the use of pyrometer apparatus. From the technical side, annealing occurs when the cooling process is slow; tempering and hardening when it is abrupt.

BLACKSMITHS.

But few workmen under this trade classification were found in the establishments visited. The blacksmith is usually found in plants where both blacksmith work and drop forging are done and usually does general anvil work on the fittings used about the plant. Machine processes have steadily replaced the hand work which is ordinarily associated with this trade. Tool sharpeners may be classified as specialized blacksmiths.

FORGERS AND HAMMERMEN.

A forger operates a drop forge; a hammerman, a power hammer. These trades are very closely allied, the operations differing in that the hammerman's work is usually preliminary, consisting of breaking down and drawing out the stock before it is forged to a specified size by the drop forge. In many industries, however, the hammer hand shapes the metal for further use in the machine shop or elsewhere, wherever such may be accomplished by hammering without the need for accurate size. Both operations are confined to the forge shop. In limited detail, the work of the forger consists in heating the bar of stock to a malleable temperature, for which purpose a gas blast furnace is usually employed, then transferring it by tongs to the anvil of the drop hammer where the under half section of the die has been fixed. With the piece to be forged in its proper place with regard to the die, a treadle is struck and the hammer carrying the stamp or top section of the die descends and by the force of the blow, the metal piece is made to conform to the shape of the die. One blow is usually sufficient, but occasionally a series of blows is required when the metal does not yield on account of improper heat treatment or wrong adjustment of the die. The blows of the drop hammer (which is steam or electric driven) are delivered with terrific force and as a result the forger throughout the work is subjected to the noise of intense pounding. Because of the continuous use of heat in a forge shop there is greater activity during the winter months.

METAL SHEAR OPERATORS.

A mechanic whose work involves the use of mechanical shears for cutting sheet metal, varying in size from a bench tool to that requiring the services of two or more men.

PICKLERS.

A pickler dips the forging into vitriol or some other chemical agent to remove the scale which forms on the surface of forgings.

TRIMMERS.

A surplus of stock spreads outside the shape given to the roughly forged piece of metal by the die of the drop hammer, and this is removed by a trimming press which also is provided with dies of the same shape as those of the drop forge.

Forge Shop Helpers.

All the tradesmen in the forge shop have their helpers, who directly assist and may substitute in the absence of the journeymen.

2. FOUNDRIES.

In a foundry, by the use of suitable molds, molten metal is converted into particular shapes or objects; such forms are called castings and their production proceeds in the following order: (1) The part is designed and a blue print of it is completed by the engineering department; (2) a pattern, made by the pattern maker to conform to the specifications of the blue print, is furnished the molder; (3) using loam or a specially prepared sand, a mold is made from the pattern into which is poured molten metal; (4) after a certain period of cooling, the casting is taken from the sand and sent to the cleaning room, where it is chipped and ground for the market or for further use in the machine shop. The several divisions of foundry work have been highly developed. Foundry work, like many other trades, has in recent years been changed, as far as conditions would permit, from hand to machine processes, although because of the very nature of the trade, the molder still performs more tasks by hand than most other tradesmen.

Casting Cleaners.

This classification includes burrers, chippers, rough grinders, scratchers, snaggers, and tumbling barrel operators. The terms are applied to practically the same operations. The work of snaggers, etc., pertains to the first preparation of the castings for use and consists of chipping away the burrs, scales, sand coating, etc., from the casting after it has been removed from the sand. This is accomplished by the use of sledge hammers, pneumatic chipping chisels, hammer and chisels, coarse wire brushes, and coarse files; occasionally, also, portable grinders are used. An iron box or barrel which revolves on an axis or shaft is sometimes used. When the barrel is filled and set revolving the castings rattle against one another, thereby cleaning the sand from them. Not infrequently, a chemical process of pickling is used to remove the scales and foreign substance from the surface of the castings.

Carpenters or Flask Makers.

Carpenters are here listed because they make and repair the flasks used in molding. In a strict sense, they do not belong among the metal trades, but owing to peculiar attendant conditions, they are quite necessary to the work of the metal tradesmen.

Coremakers.

The coremaker prepares the sand core, which is a separate part of the mold inserted to shape some part of the casting. The materials are the same as those used in molding, but in core making the pattern forms the mold in which the sand core is shaped, — exactly the opposite of the molding process. After being prepared by the coremaker, the core is first baked in an oven to make it hard and then turned over to the molder for use as a part of the mold he is preparing.

Cupola Furnace Tenders.

Furnace tenders help in charging and heating metal and drawing it from a cupola or stack furnace for foundry purposes. They also remove iron slag and mud from the fire-brick lining of the cupola and cover thin spots of the lining with thick, stiff clay mud, put up the bottom cupola doors, put in the bottom for the furnace, made of dry sand and dry sifted cinders, lay the fire, and put in the oblong opening in the shell of the cupola, which is "mudded up" after the fire is laid. The tapping hole in the lower part of this opening is formed with a bar which is removed when the mud opening is set. The melted iron runs out of this hole. The term "cupola furnace tenders" designates also melters' helpers, furnace hands, and furnace helpers.

Foundry Helpers and Laborers.

Included in this group are general unskilled foundry laborers, as well as coremakers' and molders' helpers. By the term "foundry helpers" is meant those workmen who are directly assisting in the work of a special trade, and who are acquiring a fundamental knowledge of the different branches of foundry work. The duties of the "general laborers" are various. They help in the pouring of the molten metal, draw the castings from the sand, carry flasks, shovel and reheap the sand after the removal of the castings, help in the preliminary cleaning of the castings by knocking off the burrs before the castings are chipped, sweep and clean up after each casting, and help about the foundry generally.

Ladlers and Pourers.

These workmen pour molten metal from small iron ladles or kettles used in carrying the metal from the cupola to the mold. The large ladles are tilted for pouring by a geared mechanism operated by the crane-ladle man.

Melters.

A melter is in charge of the operation of a cupola or other heating furnace in the foundry, and is generally responsible for the proper working of the furnace and for the minor repairs to the lining. The position is largely supervisory and requires considerable practical knowledge of the heat treatment of metals gained by long experience.

Molders, Iron and Brass.

In all foundry practice, the mold is the essential feature. Molding consists of packing damp sand about a pattern in such a manner that when the pattern is withdrawn, a cavity called the mold is left in the sand. Molten metal is then poured into the mold. In this group are included both bench and floor molders.

Molding Machine Operators.

When there are many molds of the same kind to be made of comparatively simple design, a molding machine is used. In operation, this machine does not require the attention of a skilled molder, and, because of the large number of pieces produced, it serves as a cheaper method of production. Much of the hand labor of the molder has been taken over by the molding machine.

Pattern Makers, Wood and Metal.

Upon a basis of skill and experience, pattern makers should, perhaps, be ranked as first, because their work consists of building patterns for metal castings and many castings are made from one pattern. The pattern must, therefore, be accurate and durable. Specifications for patterns are submitted to the pattern maker on blue prints, so that ability to interpret blue prints becomes an essential requirement of the trade. The pattern is then constructed of wood with tools very similar to those of the ordinary woodworker. Sometimes metal patterns are made from the wooden ones.

Picklers.

When castings are to be machined, they are sometimes cleaned by pickling. A pickler dips the casting into vitriol, the action of which eats the layer of iron oxide which forms on the outside of the castings.

Sand Blast Operators.

Perform preliminary treatment of castings by the use of a high pressure stream of sand, blown with great force against the casting.

Sand Mixers.

Prepare molding material for molders and coremakers.

Scrapers.

Remove burrs or other imperfections with abrasive hand tools.

3. MACHINE SHOPS.

Machine shop practices include grinding, turning, milling, drilling, and shaping unfinished metal to accurate size. An extensive variety of machine tools is used for this purpose, varying in design and size to accomplish the special work required of them. The equipment in the different manufacturing plants varies according to the nature of the work. There is, of course, in most shops a predominance of certain classes of work that can be best handled by a specific type of machine; all of them, however, are special applications of the basic principles of the standard machine shop tools, consisting of the lathe, drill, milling machine, planer, shaper, and grinder. To meet the demands of the machine world for faster production and lower cost, a considerable number of automatic machines have been designed. Their adoption and use have been responsible to a large degree for the economies in manufacturing secured from repeated production of the same kind of article.

The machine shop force can, in general, be graded as to skill in the following progressive order: (1) General machine operators who can operate most of the machine shop tools, but under the guidance of another; (2) specialized machine operators, as lathe hands, milling machine hands, planer hands, etc.; (3) general machinists; (4) toolmakers, die makers, gauge makers, set-up men.

Specialized machine operators are expected to be experts on the machine operated by them. While not as skilled as the general machinist, still they possess more skill than the machine operator. The lathe hand, for example, must be able to perform work of any nature that properly belongs to the lathe. It usually requires ability to read blue prints and an intimate understanding of the function of the lathe.

Bench Hands.

The classification under the name "bench hand" comprises a wide variety of occupations, the majority of which are performed by hand. Bench hands file and fit, bend, shape, and trim sheet metal, solder, scrape and do other work involving the use of vises, clamps, small anvils, small machine tools, etc. A bench hand is usually employed in the machine shop, although he is found in various other departments. Wherever found, the nature of his work is practically the same, necessitating the use of hand tools.

Die Makers and Die Sinkers.

The die maker is a journeyman machinist who has specialized in making the different kinds of dies with which forgings are shaped or stampings made. A die sinker forms impressions in die blocks with which the forgings are shaped.

Drill Press Operators.

Drill presses are perhaps more extensively used than any other machine shop tools. They are found in nearly every department of a metal trades establishment, and as their operation is comparatively simple, it is very quickly learned except where accuracy as to location of holes to be drilled is required. Fixtures are then provided and a drill operator's work becomes more specialized, because should error occur, difficulty in adjusting the fitted machine parts would delay the work of assembling. Drill press operators are sub-classified into single spindle drill operators, radial drill operators, and multiple spindle or gang drill operators. Of these three, the last is the most skilled.

Experimental Workers.

Experimental workers and model makers are engaged in building, for test, the new ideas or inventions of the engineers; proficiency in technical skill and judgment is, therefore, required. Model makers also build models of the product for exhibition and test.

Filers.

Filing is a hand operation, varying from coarse preliminary work on forgings and castings to the finished filing, requiring accuracy of size and fit.

Gauge Makers.

Gauge making is one of the most skilled trades in the metal-working industry. The gauge maker is a journeyman machinist whose work is essentially concerned with accuracy, because many pieces are measured with the same gauge, and a slight error would involve considerable delay in production and financial loss.

Grinders.

Grinders may be sub-divided into three classes, — finish grinders, rough grinders, and tool grinders. Within the first class are those who grind to size, which necessitates fine accuracy both in the adjustment of the machine and inspection of measurement by gauges, scales, etc. Also in this group are internal, surface, disc, cylindrical grinders, etc. Grinding machines are especially adapted to the economical production of large quantities of small duplicate parts that require accurate grinding.

The second class of operators, as the name indicates, are engaged in preliminary grinding of castings, forgings, and rough stock before machine shop operations, polishing or finishing take place. In this group are wet grinders, grinders (foundry), grinders (forge), etc.

The members of the third group sharpen the tools, both hand and machine, for use about the factory. In the smaller industries most workmen sharpen their own tools, but in the larger plants it has been found to be more efficient to provide tool grinders as a special group, among whom are cutter grinders, gauge grinders, tool grinders, tool sharpeners, etc.

Lathe Hands.

These are operators who run machines designed for machining cylindrical surfaces. Lathes are made in many sizes and forms varying from the jewelers' lathe to a huge engine lathe. The lathes commonly used are constructed so as to cause the material to turn with greater or less speed before a tool which is held stationary.

TURRET LATHE OPERATORS.

The turret lathe is developed from the ordinary lathe by the addition of a revolving tool-handling device called a turret. This turret contains a number of tool spindles. A succession of operations upon a piece of work can thus be accomplished without removing the work from the lathe.

LAY-OUT MEN.

A lay-out man is furnished with a blue print plan of the way the metal is to be drilled and trimmed. By the use of scales, dividers, and rule, he determines how the plan can be best applied to the stock, and then marks the stock accordingly. This is the highest grade of work in the sheet metal industry and the product is of great variety, from kitchen utensils to boiler plates.

LEADING OPERATORS.

The employment of leading operators is for the purpose of encouraging production by making the most expert operators the pace setters to other hands in the same work. They are employed only in the large establishments where system and specialization have been introduced.

MACHINE OPERATORS.

Machine operators may be defined as that group of workers in the metal trades who are able to operate the standard machines used in machine shops, including lathes, drills, shapers, planers, etc. The difference between machinists and machine operators is primarily a matter of skill. Less native ability is required of a machine operator than of other machinists because of the repetition of comparatively few operations. He may know only the operations he is instructed to perform. The machine operator understands the mechanical function of the machine, but is usually unable to adjust the machine, without instruction, so as to perform any particular work assigned. When the machine is properly adjusted, however, he is able to operate it.

MACHINE OPERATORS (AUTOMATIC).

Automatic machines are designed especially for turning out a great variety of repetition work at high speed. They are almost always highly specialized machines, yet simple in operation. Among the automatic machine operators are included all those who run machines which are designed to act automatically, except the automatic screw machine operator. The operation of the automatic screw machine needs greater skill, especially in the setting up.

Machinists (General).

The term machinist, while being perhaps the most common in the metal trades, has, through the development of industry, come to mean a very definite occupation. Machinists are skilled mechanics who know how to use all of the machine tools of the trade and are able to obtain a full understanding of mechanical requirements from the shop blue prints. A qualified machinist is able to apply his knowledge of the fundamentals of his trade to the varying conditions of different shops.

Milling Machine Operators.

There are two types of milling machines, — hand and power, — differing in the manner in which the work is guided past the cutters. A hand milling machine requires the constant attendance of the operator, whereas the power milling machine operator needs only to assist the work to the moving carriage which guides it under the cutters. The operating principle of a milling machine is the same as that of a circular saw. The grade of skill required for the operation of these machines varies with the plant where they are in use.

Planer Hands.

The planer is a most important tool in a machine shop. As its name indicates, it is used for machining plane or flat surfaces. The piece is firmly secured on a flat bed or table which moves backward and forward under a stationary tool.

Press Operators.

Presses in the metal trades are of three general types, — punch, drill, and shaping, — depending upon the nature of their operation. *Punch presses* employ the cutting principle of stamp and die and in nearly all plants are power driven. Special names are given to the various applications of the principle of the punch press, such as trimming press, foot press, kick press, etc., indicating the manner in which it is operated or its special work. Shaping presses are used to bend sheet metal over special forms. The metal may or may not be heated, and the size of machine varies from the small bench presses operated by women to the huge bull-dozers requiring the services of two or three men. Within this classification are found hydraulic, taper, draw, rolling presses, etc. The principal requirements of the operator are dexterity and quick action in changing the position of the material being worked upon, and he must be able to recognize within certain limits evidences of any changes in the properties of the metal which might render it defective for use.

Screw Machine Operators.

Of the specialized machine operators, a hand screw operator is perhaps the most skilled. The hand screw machine and turret lathe are a development of the idea of the engine lathe.

Set-up and Linemen.

Much of the work of the larger establishments becomes standardized and involves a steady repetition of detail. It has, therefore, been found to be economical to install many automatic and semi-automatic machines, especially designed for the manufacture of the desired parts. Partly skilled hands run these machines, but have not acquired the knowledge to adjust them or repair or re-start them should they for any reason become disabled. For this purpose, set-up men, who thoroughly understand the machines, are employed. Each set-up man may have a line or battery of several machines to supervise. A tool setter's work is similar.

Straighteners.

In the course of manufacture, metal parts become contracted or bowed due to heat action or the strain endured in the machine processes. Straighteners work with vises, presses and hand tools to make the part conform to its proper specifications. Their work is more important when parts must "line-up". "Aligning" is a variety of straightening.

Tool Makers and Die Makers.

Tool making, die making, and gauge making can properly be called the most skilled trade in the metal industry. The work demands special requirements of an all-round machinist. Precision of work is an absolute essential in the tool room. The work must be performed not only with the finest accuracy, but the trade also requires knowledge of the operating features and use of the various machine tools, as well as the properties of tool steel. The tool maker should be able to interpret detailed drawings and figure dimensions or reproduce from samples.

4. MISCELLANEOUS DEPARTMENTS.

In metal trades establishments, in addition to the primary departments, namely, the blacksmith and forge shop, the foundry, and the machine shop, there usually exists a special department which may be considered an addition to any or all of the former. The principal branches of work conducted in this department are assembling, inspecting, buffing and polishing, sheet metal work, testing, etc. In large scale production, the many parts going to make up the finished article are made in departments scattered throughout the plant. Therefore, it becomes the special work of a group called assemblers and erectors to assemble these parts as they are delivered from the other departments.

Because of the wide use of semi-automatic and automatic machines and the tendency of manufacturers to sub-divide the manufacture of the product into many specialized operations, the need for checking the accuracy of the work is apparent, and, consequently, inspectors are employed for this purpose.

Much of the product of metal trades establishments has a mechanical function to perform; therefore, before delivery, a preliminary test or examination is made by specialized employees called testers. This branch of work is usually the final one within the factory.

Other miscellaneous occupations are polishing and buffing, crane operating, sheet metal work, plating, welding, etc., included in this group because in a strict sense they do not belong to any one of the standard departments.

Assemblers and Erectors.

While the general character of the work performed by assemblers and erectors has certain features in common, the occupations differ because of the size of the parts assembled. Erectors set up large machines like paper mill machinery, woolen mill machinery, radial drills, screw machines, etc. Assemblers may deal even with such small parts as those used in watch making and must generally be able to do fine work in filing and fitting. Both erectors and assemblers put together the separate parts or units made in the various departments of the industry.

Cranemen.

In smaller concerns where small cranes are in use, the crane operator and craneman are not distinguished from one another. In larger plants, using powerful overhead cranes, are found special crane operators whose sole work is the movement of the crane. Objects to be moved are attached to and removed from the hook by men called cranemen, crane followers, crane hitchers, etc.

Finishers.

Finishers coat the product for the market after the parts have been ground, polished, or plated. Trades allied with that of finishers are browners, bluers, whiteners, sheradizers, enamelers, painters, etc. A browner browns the metal parts to prevent rusting. The part is dipped in acid, cleaned, and dipped again. It is thus artificially rusted and preserved. A bluer performs the operation by which metal parts are blued, by dipping the parts in a hot solution of saltpetre. By a dipping process, a whitener "dull coats" a forging after it has been sand-blasted. This coat cannot be buffed or polished, thereby differing from plating.

Foremen.

In this group are classified the foremen in all of the departments. Foremen are supposed to train the men in their work, direct their labor, systematize the processes of the plant and furnish the expert technical knowledge needed. This group includes working foremen only.

Helpers.

Helpers may be grouped under two broad headings, — journeymen's helpers and general helpers. The former are so designated because they directly assist in the work of a special trade and must have some general knowledge of it. In many trades, a helper is virtually an apprentice learning the trade. In the first group are machine shop helpers, millwrights' helpers, inspectors' helpers, tinsmiths' helpers, platers' helpers, etc. In the second group are found workmen who bring stock to the machine, clear away the scrap, assist in moving heavy parts, etc. This sort of work is not performed in any one department, but may be found in all departments and is essentially unskilled.

Inspectors.

Inspectors perform their work principally with gauges, micrometers, or other measuring devices to ascertain whether the different parts come within drawing specifications. In some branches of work they examine merely by count or detect defects in the product of the plant by inspection.

METAL SPINNERS.

Metal spinning is a machine operation and consists of bending a disc of metal over revolving forms, so as to make the metal conform to a given shape.

MILLWRIGHTS.

Millwrights install, move, and repair the machines of which the factory equipment consists.

PLATERS.

Platers perform plating operations, — nickel, silver, etc., — by means of electrolysis.

POLISHERS AND BUFFERS.

With polishers are associated buffers and burnishers. Polishers polish castings and forgings with or without preliminary grinding. Buffers polish plated metal. Burnishers polish high-class plated ware by hand.

REPAIRMEN.

Repairmen do the repair work required on the shop equipment or repair returned apparatus that has proven defective, and are general mechanics.

ROLLING MILL HANDS.

Rolling mill hands handle the wire as it is cold rolled from large size to small.

SHEET METAL WORKERS.

Bench or floor workers who bend, cut, and form sheet metal into given shapes as, for example, cooking utensils, light tanks, mud guards for automobiles, etc. Tinsmiths are classified under this group.

TESTERS.

The largest establishments maintain separate departments where a force of workmen do nothing but test the product for size, finish, and accuracy. The function of testers is to make certain by prescribed tests that the article of production meets the demands of its specifications before it is shipped to the consumer or placed upon the market for sale. Obviously, a tester's work varies with the nature of the product of the factory.

WELDERS (GAS AND ELECTRIC).

Welders operate the apparatus used in welding sheet metal or plate work. In the manufacture of the various tools, utensils, and implements made of metal, much of the work is now welded that was formerly riveted and soldered. The several processes of welding in use include electric arc, electric spot, oxyacetylene, etc.

WINDERS.

Winders operate a special machine, resembling a lathe, equipped with a suitable revolving form about which wire is wound. They wind motor and transformer coils.

VII.

DETAILED STATISTICAL TABLES.

Table A. — Average Earnings and Hours of Labor of Male Metal Workers, 18 Years of Age and Over, by Occupations.

Table B. — Average Earnings and Hours of Labor of Female Metal Workers, 18 Years of Age and Over, by Occupations.

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor
				Average per Hour	Average per Week	
BLACKSMITH AND FORGE SHOP.						
Annealers, Hardeners, and Temperers.						
Time-workers:						
1914,	9	35	$0.252	$0.252	$11.94	47.8
1915,	11	35	.278	.282	15.95	56.8
1916,	12	61	.310	.320	18.16	56.7
1917,	11	100	.351	.380	20.51	54.0
1918,	13	106	.411	.479	26.68	55.7
1919,	9	124	.454	.489	26.17	53.5
Piece-workers:						
1914,	3	5	–	.373	18.06	48.5
1915,	3	5	–	.311	18.16	58.5
1916,	2	7	–	.374	17.76	47.4
1917,	2	2	–	.458	24.87	54.3
1918,	3	31	–	.631	38.56	61.1
1919,	5	9	–	.636	33.14	52.1
Blacksmiths.						
Time-workers:						
1914,	10	33	.294	.294	13.33	45.3
1915,	11	41	.296	.296	15.60	52.8
1916,	14	60	.335	.342	18.57	54.3
1917,	16	64	.400	.427	23.37	54.7
1918,	15	70	.549	.587	31.16	53.1
1919,	14	56	.566	.599	30.58	51.0
Piece-workers:						
1914,	1	1	–	.400	5.20	13.0
1915,	2	3	–	.395	18.69	47.3
1916,	1	1	–	.455	20.50	45.0
1917,	1	3	–	.433	20.70	47.8
1918,	1	3	–	.635	29.17	45.9
1919,	3	9	–	.579	30.21	52.1
Forgers and Hammermen.						
Time-workers:						
1914,	1	5	.524	.524	28.82	55.0
1915,	1	5	.506	.511	27.91	54.6
1916,	1	5	.528	.528	28.91	54.8
1917,	2	7	.481	.484	22.77	47.0
1918,	3	13	.587	.614	30.70	50.0
1919,	4	16	.711	.723	36.30	50.2
Piece-workers:						
1914,	3	11	–	.544	23.41	43.1
1915,	3	8	–	.517	23.94	46.3
1916,	3	9	–	.535	25.52	47.7
1917,	3	5	–	.693	36.54	52.7
1918,	4	6	–	.755	37.59	49.8
1919,	3	6	–	.889	41.44	46.6
Piece and time-workers:						
1914,	1	1	.270	.639	20.46	32.0
1915,	1	4	.263	.513	25.90	50.5
1916,	1	7	.290	.570	28.47	50.0
1917,	1	8	.283	.707	35.44	50.1
1918,	1	9	.500	.922	38.23	41.5
1919,	1	5	.724	1.096	44.27	40.4

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914-1919 — Continued.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor
				Average per Hour	Average per Week	
FOUNDRY.						
Casting Cleaners.						
Time-workers:						
1914,	12	190	$0.183	$0.183	$8.21	45.0
1915,	13	185	.186	.187	10.15	54.3
1916,	16	245	.231	.241	13.58	56.3
1917,	15	340	.284	.317	18.08	57.0
1918,	16	425	.391	.440	23.32	53.0
1919,	15	283	.437	.484	25.86	53.5
Piece-workers:						
1914,	5	69	-	.266	13.54	51.0
1915,	3	62	-	.284	15.52	54.7
1916,	5	64	-	.329	17.65	53.6
1917,	6	71	-	.421	21.81	51.8
1918,	7	76	-	.539	27.42	50.8
1919,	4	98	-	.650	34.56	53.2
Piece and time-workers:						
1914,	1	1	.200	.213	8.40	39.5
1915,	3	11	.182	.245	12.58	51.4
1916,	2	13	.218	.289	15.07	52.1
1917,	2	19	.276	.375	18.55	49.5
1918,	1	15	.389	.514	25.04	48.7
1919,	1	16	.459	.702	28.67	40.8
Coremakers.						
Time-workers:						
1914,	14	58	.260	.260	11.22	43.2
1915,	15	61	.266	.269	14.27	53.0
1916,	16	99	.299	.305	17.53	57.4
1917,	15	136	.338	.364	19.71	54.1
1918,	17	148	.478	.518	26.51	51.2
1919,	17	152	.561	.573	27.66	48.3
Piece-workers:						
1914,	3	28	-	.260	8.79	33.8
1915,	2	14	-	.283	11.62	41.1
1916,	4	22	-	.373	19.41	52.1
1917,	4	16	-	.439	22.12	50.4
1918,	4	16	-	.586	27.62	47.1
1919,	4	20	-	.622	31.76	51.1
Piece and time-workers:						
1915,	1	3	.200	.277	13.87	50.0
1916,	1	3	.293	.320	19.82	62.0
Cupola Furnace Hands.						
Time-workers:						
1914,	11	45	.216	.216	10.34	47.9
1915,	11	27	.208	.209	11.77	56.4
1916,	12	50	.250	.253	14.99	59.3
1917,	13	67	.299	.323	18.81	58.3
1918,	15	32	.418	.466	25.77	55.3
1919,	9	35	.495	.519	28.68	55.3
Piece-workers:						
1914,	1	2	-	.250	11.26	45.0
1915,	1	2	-	.259	14.00	54.0
1916,	1	2	-	.292	15.75	54.0
1917,	2	3	-	.398	22.82	57.3
1918,	1	29	-	.475	23.54	49.6
1919,	1	16	-	.517	26.79	51.8

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — CONTINUED.

DEPARTMENTS, OCCUPATIONS, BASES OF PAYMENT, AND YEARS.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	ACTUAL EARNINGS		Average Actual Hours of Labor
				Average per Hour	Average per Week	
FOUNDRY—Con.						
Melters.						
Time-workers:						
1914,	13	19	$0.286	$0.286	$13.94	48.8
1915,	14	17	.300	.304	16.88	55.6
1916,	15	27	.317	.331	18.53	55.9
1917,	15	30	.377	.403	22.71	56.4
1918,	13	24	.473	.522	27.63	53.0
1919,	14	27	.555	.581	32.13	55.3
Piece-workers:						
1917,	1	1	–	.396	21.00	53.0
1918,	1	3	–	.577	30.00	52.0
1919,	1	6	–	.625	33.75	54.1
Molders.						
Time-workers:						
1914,	15	198	.337	.340	14.42	42.4
1915,	15	205	.341	.344	18.25	53.1
1916,	15	367	.365	.374	20.30	54.3
1917,	17	311	.451	.470	24.95	53.1
1918,	17	358	.576	.612	30.87	50.4
1919,	17	380	.661	.682	32.92	48.3
Piece-workers:						
1914,	8	[1] 74	–	.357	15.91	44.6
1915,	8	176	–	.461	20.65	44.8
1916,	10	[1] 127	–	.423	20.59	48.7
1917,	6	302	–	.664	33.83	50.9
1918,	8	319	–	.764	36.68	48.0
1919,	6	355	–	1.018	46.99	46.1
Piece and time-workers:						
1914,	1	5	.274	.338	13.76	40.7
1915,	1	6	.235	.296	13.92	47.0
1916,	1	2	.300	.378	18.72	49.5
1917,	1	10	.330	.504	29.44	58.4
Pattern Makers.						
Time-workers:						
1914,	15	104	.334	.334	15.29	45.9
1915,	14	112	.353	.359	20.06	55.8
1916,	18	138	.383	.385	20.48	53.1
1917,	14	150	.444	.484	26.49	54.7
1918,	15	145	.580	.620	32.23	52.0
1919,	18	140	.652	.686	34.34	50.0
MACHINE SHOP.						
Bench Hands.						
Time-workers:						
1914,	8	111	.216	.216	11.02	51.0
1915,	10	127	.213	.216	11.89	55.0
1916,	12	214	.254	.265	14.48	54.7
1917,	15	210	.317	.352	19.56	55.6
1918,	15	259	.449	.499	26.82	53.7
1919,	10	151	.478	.499	24.44	49.0
Piece-workers:						
1914,	6	70	–	.286	10.83	37.9
1915,	6	123	–	.327	16.78	51.3
1916,	7	164	–	.348	16.59	47.6
1917,	7	169	–	.408	20.89	51.2
1918,	7	124	–	.557	27.92	50.1
1919,	6	153	–	.600	28.76	47.9

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[1] Not including 151 molders in 1914 and 166 molders in 1916, for whom complete information could not be obtained from pay-rolls.

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — Continued.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings: Average per Hour	Actual Earnings: Average per Week	Average Actual Hours of Labor
MACHINE SHOP — Con.						
Bench Hands — Con.						
Piece and time-workers:						
1914,	2	5	$0.198	$0.218	$7.43	34.0
1915,	2	14	.255	.311	13.59	43.7
1916,	2	18	.213	.287	13.49	47.0
1917,	1	2	.300	.319	15.51	48.5
Drillers.						
Time-workers:						
1914,	10	131	.194	.194	10.22	52.6
1915,	14	195	.204	.206	11.21	54.4
1916,	17	395	.237	.244	12.37	50.6
1917,	18	268	.284	.309	16.54	53.4
1918,	17	227	.434	.524	25.93	49.5
1919,	16	137	.479	.484	22.24	45.9
Piece-workers:						
1914,	6	107	-	.296	11.75	39.6
1915,	8	147	-	.305	16.44	53.8
1916,	8	237	-	.355	18.16	51.2
1917,	6	288	-	.420	21.37	50.9
1918,	7	294	-	.565	28.54	50.5
1919,	7	331	-	.611	29.88	48.9
Piece and time-workers:						
1914,	3	8	.183	.236	7.64	32.3
1915,	3	21	.229	.293	15.25	52.0
1916,	3	31	.209	.288	14.45	50.1
1917,	2	16	.285	.369	17.80	48.2
Gauge Makers.						
Time-workers:						
1914,	4	41	.380	.380	15.54	40.9
1915,	4	53	.382	.383	19.86	51.9
1916,	5	52	.436	.440	22.72	51.6
1917,	3	33	.560	.579	28.29	48.8
1918,	6	34	.702	.740	34.75	47.0
1919,	3	19	.601	.601	29.43	48.9
Piece-workers:						
1919,	1	6	-	.770	36.62	47.5
Grinders.						
Time-workers:						
1914,	9	35	.220	.220	10.19	46.5
1915,	11	53	.243	.247	14.01	56.8
1916,	16	79	.279	.287	15.59	54.3
1917,	16	129	.342	.353	17.38	49.2
1918,	16	123	.444	.481	24.47	50.8
1919,	15	42	.479	.488	21.89	44.8
Piece-workers:						
1914,	7	33	-	.308	12.79	41.5
1915,	8	50	-	.335	16.82	50.1
1916,	8	71	-	.413	18.81	45.5
1917,	7	66	-	.479	25.05	52.3
1918,	9	110	-	.620	31.59	51.0
1919,	8	76	-	.704	35.37	50.2
Piece and time-workers:						
1914,	1	6	.187	.222	9.01	40.5
1915,	4	11	.258	.366	17.54	47.9
1916,	5	17	.276	.378	17.97	47.6
1917,	1	2	.260	.419	19.38	46.3
1918,	2	6	.333	.533	28.39	53.2

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — Continued.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings: Average per Hour	Actual Earnings: Average per Week	Average Actual Hours of Labor
MACHINE SHOP—Con.						
Lathe Hands.						
Time-workers:						
1914,	15	179	$0.228	$0.228	$11.42	50.2
1915,	16	218	.240	.244	13.13	53.8
1916,	19	589	.269	.282	14.81	52.5
1917,	18	391	.325	.358	18.37	51.3
1918,	16	456	.472	.535	26.32	49.2
1919,	15	235	.523	.540	24.63	45.6
Piece-workers:						
1914,	8	80	–	.314	12.70	40.4
1915,	8	128	–	.326	17.66	54.2
1916,	8	249	–	.404	20.28	50.2
1917,	8	247	–	.456	23.67	51.9
1918,	9	301	–	.610	31.90	52.3
1919,	8	272	–	.655	32.03	48.9
Piece and time-workers:						
1914,	2	4	.300	.326	14.03	43.0
1915,	4	11	.283	.346	17.21	49.7
1916,	5	21	.299	.377	17.89	47.5
1917,	3	15	.307	.419	23.73	56.6
1918,	2	38	.352	.515	27.30	53.0
Machinists, General.						
Time-workers:						
1914,	19	296	.294	.294	14.26	48.6
1915,	21	305	.295	.302	17.04	56.3
1916,	22	344	.352	.361	19.79	54.8
1917,	21	315	.403	.419	21.74	51.9
1918,	21	381	.561	.617	31.69	51.4
1919,	17	287	.613	.632	30.66	48.5
Piece-workers:						
1914,	6	28	–	.353	15.08	42.7
1915,	5	36	–	.411	21.39	52.0
1916,	5	42	–	.433	21.58	49.8
1917,	4	34	–	.512	26.43	51.6
1918,	7	32	–	.667	32.80	49.2
1919,	5	45	–	.733	35.10	47.9
Piece and time-workers:						
1914,	1	2	.210	.261	11.79	45.3
1915,	3	13	.356	.381	19.70	51.7
1916,	2	9	.364	.455	23.86	52.4
Milling Machine Operators.						
Time-workers:						
1914,	9	67	.219	.219	10.69	48.8
1915,	9	67	.237	.242	13.07	54.0
1916,	11	183	.270	.278	14.85	53.4
1917,	12	194	.300	.322	16.30	50.6
1918,	11	189	.436	.499	24.72	49.6
1919,	14	114	.457	.472	23.25	49.3
Piece-workers:						
1914,	7	53	–	.265	11.22	42.3
1915,	7	79	–	.291	15.83	54.3
1916,	7	89	–	.347	17.72	51.1
1917,	7	79	–	.426	21.58	50.6
1918,	6	144	–	.581	29.31	50.5
1919,	8	147	–	.626	32.19	51.5
Piece and time-workers:						
1914,	2	3	.270	.287	11.12	38.7
1915,	2	16	.267	.349	16.66	47.7
1916,	3	5	.290	.462	20.34	44.1
1917,	1	3	.333	.481	26.83	55.8

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — Continued.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor
				Average per Hour	Average per Week	
MACHINE SHOP — Con.						
Screw Machine Operators.						
Time-workers:						
1914,	9	57	$0.232	$0.232	$10.52	45.4
1915,	12	70	.251	.254	13.39	52.7
1916,	10	144	.305	.316	17.27	54.6
1917,	8	76	.344	.350	17.37	49.6
1918,	11	118	.423	.454	24.16	53.2
1919,	8	69	.472	.507	24.24	47.8
Piece-workers:						
1914,	5	44	-	.296	11.54	39.0
1915,	5	55	-	.349	18.24	52.3
1916,	7	172	-	.460	22.25	48.3
1917,	6	87	-	.477	23.83	50.0
1918,	7	147	-	.594	28.08	47.3
1919,	5	107	-	.611	29.80	48.7
Piece and time-workers:						
1914,	4	12	.217	.258	7.82	30.4
1915,	3	34	.215	.303	15.95	52.6
1916,	3	43	.219	.371	19.33	52.1
1917,	2	22	.282	.384	18.49	48.1
1918,	1	7	.314	.479	23.80	49.7
Set-up Men.						
Time-workers:						
1914,	5	10	.295	.295	12.07	40.8
1915,	5	14	.333	.333	18.24	54.8
1916,	7	85	.380	.396	20.93	52.8
1917,	9	81	.395	.416	22.80	54.8
1918,	10	92	.541	.598	32.44	54.3
1919,	6	17	.618	.630	27.92	44.3
Piece-workers:						
1914,	1	3	-	.353	14.12	40.0
1915,	3	4	-	.388	18.71	48.2
1916,	3	9	-	.401	20.34	50.7
1917,	4	5	-	.434	22.20	51.2
1918,	5	18	-	.621	33.66	54.2
1919,	2	3	-	.536	29.02	54.1
Piece and time-workers:						
1914,	1	1	.290	.339	13.56	40.0
1915,	1	3	.307	.401	20.27	50.5
1916,	2	3	.367	.434	21.44	49.4
Tool Makers.						
Time-workers:						
1914,	14	111	.334	.334	15.16	45.4
1915,	17	171	.355	.356	19.32	54.3
1916,	19	285	.406	.416	22.24	53.4
1917,	19	254	.452	.468	23.60	50.4
1918,	20	343	.610	.671	34.14	50.9
1919,	21	312	.665	.679	32.93	48.5
Piece-workers:						
1914,	2	3	-	.392	20.02	51.0
1915,	2	31	-	.468	21.65	46.2
1916,	2	21	-	.496	22.73	45.9
1917,	2	47	-	.582	26.38	45.3
1918,	2	58	-	.781	40.18	51.4
1919,	3	28	-	.824	42.58	51.7
Piece and time-workers:						
1915,	1	11	.379	.423	17.94	42.4
1916,	1	10	.452	.493	22.67	46.0
1918,	1	1	.750	.847	69.50	82.0

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — Continued.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor
				Average per Hour	Average per Week	
MISCELLANEOUS DEPARTMENTS.						
Assemblers.						
Time-workers:						
1914,	9	98	$0.248	$0.248	$10.19	41.2
1915,	11	80	.248	.248	12.95	52.2
1916,	12	188	.262	.269	13.91	51.7
1917,	14	203	.323	.342	17.95	52.4
1918,	14	201	.419	.449	22.42	49.9
1919,	18	177	.498	.505	25.08	49.6
Piece-workers:						
1914,	5	325	–	.333	12.60	37.9
1915,	4	302	–	.330	16.09	48.7
1916,	8	430	–	.360	17.62	48.9
1917,	8	706	–	.469	22.64	48.3
1918,	6	554	–	.663	31.77	47.9
1919,	9	422	–	.691	31.78	46.0
Piece and time-workers:						
1914,	4	25	.240	.286	11.00	38.5
1915,	3	35	.266	.353	17.57	49.8
1916,	4	52	.238	.361	16.85	46.7
1917,	2	41	.301	.407	20.26	49.8
1918,	3	22	.377	.518	26.04	50.2
1919,	1	13	.489	.629	28.41	45.1
Inspectors.						
Time-workers:						
1914,	8	100	.273	.273	11.28	41.3
1915,	10	109	.295	.302	16.37	54.3
1916,	13	512	.277	.286	14.46	50.7
1917,	13	284	.338	.359	18.71	52.1
1918,	14	310	.451	.482	24.95	51.7
1919,	15	276	.512	.539	26.32	49.1
Piece-workers:						
1914,	2	3	–	.308	12.30	39.9
1915,	3	4	–	.255	13.99	54.8
1916,	2	12	–	.355	16.81	47.4
1917,	2	13	–	.434	20.88	48.1
1918,	2	7	–	.503	21.83	43.5
1919,	5	4	–	.600	24.60	41.0
Piece and time-workers:						
1914,	2	4	.283	.314	10.19	32.5
1915,	1	1	.250	.298	11.55	38.8
1916,	1	12	.257	.325	14.89	45.9
1918,	1	1	.330	.404	23.85	59.0
Polishers and Buffers.						
Time-workers:						
1914,	10	46	.240	.240	11.72	48.6
1915,	7	43	.243	.243	13.74	56.5
1916,	11	74	.244	.257	12.05	47.0
1917,	10	110	.311	.324	16.11	49.7
1918,	8	65	.395	.438	21.59	49.3
1919,	10	47	.453	.461	22.53	48.8
Piece-workers:						
1914,	6	126	–	.282	11.56	41.0
1915,	8	141	–	.305	15.72	51.6
1916,	8	180	–	.363	18.38	50.7
1917,	9	101	–	.488	23.76	48.7
1918,	10	136	–	.602	28.96	48.1
1919,	10	153	–	.608	29.91	49.2

TABLE A. — AVERAGE EARNINGS AND HOURS OF LABOR OF MALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — Concluded.

Departments, Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Male Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor
				Average per Hour	Average per Week	
MISCELLANEOUS DEPARTMENTS — Con.						
Polishers and Buffers — Con.						
Piece and time-workers:						
1914,	5	16	$0.236	$0.293	$11.03	37.7
1915,	5	17	.190	.302	15.04	49.8
1916,	4	15	.227	.331	16.77	50.6
1917,	2	5	.284	.475	23.17	48.7
1918,	2	5	.502	.614	31.60	51.5
1919,	1	4	.485	.581	27.48	47.3
Sheet Metal Workers.						
Time-workers:						
1914,	3	7	.255	.255	10.82	42.4
1915,	5	6	.295	.297	15.63	52.6
1916,	6	17	.302	.317	16.34	51.6
1917,	8	25	.352	.378	21.71	57.5
1918,	10	28	.490	.530	27.77	52.4
1919,	6	15	.553	.600	31.15	51.9
Piece-workers:						
1914,	1	11	-	.364	13.76	37.8
1915,	1	9	-	.396	21.77	55.0
1916,	1	25	-	.397	20.19	50.8
1917,	1	12	-	.542	25.65	47.3
1918,	1	7	-	.798	38.63	48.4
Testers.						
Time-workers:						
1914,	6	42	.236	.236	9.87	41.9
1915,	7	78	.240	.241	12.27	50.8
1916,	8	77	.266	.268	13.97	52.1
1917,	6	177	.358	.385	19.70	51.2
1918,	5	143	.453	.488	24.08	49.4
1919,	5	141	.504	.533	26.70	50.1
Piece-workers:						
1914,	2	16	-	.306	12.28	40.1
1915,	2	10	-	.288	14.90	51.8
1916,	1	12	-	.343	18.77	54.7
1917,	1	20	-	.532	28.96	56.3
1918,	1	10	-	.850	42.97	50.6
1919,	1	11	-	.640	31.18	48.8
Piece and time-workers:						
1915,	1	2	.180	.191	8.37	43.9
1916,	1	2	.255	.309	15.42	50.0
1917,	1	3	.273	.366	19.40	53.0
Welders.						
Time-workers:						
1914,	2	7	.298	.298	12.93	43.5
1915,	2	8	.300	.303	16.85	55.7
1916,	2	14	.344	.349	19.63	56.2
1917,	2	22	.424	.456	23.31	51.1
1918,	3	25	.577	.597	29.00	48.6
1919,	6	22	.627	.648	31.79	49.0
Piece-workers:						
1914,	1	10	-	.325	12.96	39.8
1915,	1	7	-	.372	20.17	54.2
1916,	2	19	-	.402	21.25	52.9
1917,	2	61	-	.566	25.17	44.5
1918,	2	39	-	.993	46.11	46.4
1919,	2	37	-	.701	35.35	50.4

TABLE B. — AVERAGE EARNINGS AND HOURS OF LABOR OF FEMALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919.

Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Female Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor
				Average per Hour	Average per Week	
Assemblers.						
Time-workers:						
1914,	3	8	$0.130	$0.139	$6.38	49.5
1915,	4	18	.143	.143	7.20	50.4
1916,	4	42	.158	.161	8.54	53.0
1917,	4	89	.160	.161	7.30	45.2
1918,	9	116	.251	.259	9.88	38.1
1919,	6	66	.265	.266	11.24	42.2
Piece-workers:						
1914,	5	151	–	.194	7.65	39.4
1915,	6	181	–	.189	9.18	48.6
1916,	6	285	–	.190	8.93	47.0
1917,	5	422	–	.292	13.15	44.9
1918,	7	327	–	.430	18.85	43.8
1919,	7	330	–	.427	18.72	43.8
Piece and time-workers:						
1914,	1	2	.115	.139	5.48	39.3
1915,	3	29	.160	.214	9.67	45.1
1916,	1	8	.100	.122	5.99	48.8
1917,	2	27	.172	.198	8.99	45.3
1918,	1	5	.220	.354	13.61	38.4
1919,	1	12	.290	.339	14.36	42.3
Bench Hands.						
Time-workers:						
1914,	1	1	.150	.150	5.55	37.0
1915,	1	2	.168	.168	5.22	31.0
1916,	2	10	.149	.149	7.45	49.7
1917,	2	4	.158	.166	8.74	52.8
1918,	2	21	.280	.311	14.30	45.9
1919,	6	14	.298	.308	13.00	42.2
Piece-workers:						
1914,	1	8	–	.183	6.66	36.3
1915,	2	27	–	.212	8.68	41.0
1916,	1	43	–	.218	10.53	48.2
1917,	3	47	–	.291	12.46	42.8
1918,	3	33	–	.409	16.45	40.2
1919,	3	21	–	.404	18.23	45.2
Piece and time-workers:						
1915,	1	5	.166	.224	10.17	45.4
1916,	1	9	.101	.215	9.53	44.3
1919,	1	1	.290	.384	18.45	48.0
Coremakers.						
Time-workers:						
1914,	1	26	.117	.117	3.70	31.7
1915,	1	9	.117	.117	5.80	49.6
1916,	3	20	.138	.143	7.29	50.6
1917,	3	25	.165	.183	8.93	48.9
1918,	5	52	.244	.263	10.35	39.4
1919,	5	43	.294	.294	12.99	44.2
Piece-workers:						
1914,	2	21	–	.198	6.89	34.8
1915,	2	24	–	.184	8.87	48.0
1916,	4	64	–	.216	11.30	52.3
1917,	4	72	–	.272	13.52	49.7
1918,	5	64	–	.357	15.47	43.3
1919,	5	58	–	.421	19.69	46.7
Piece and time-workers:						
1914,	1	8	.108	.183	7.18	39.3
1915,	1	13	.112	.147	7.43	50.5
1916,	1	4	.125	.197	8.85	44.8
1917,	1	4	.160	.233	11.12	47.8
1918,	2	2	.275	.368	14.04	38.1
1919,	1	7	.286	.328	15.76	48.0

TABLE B. — AVERAGE EARNINGS AND HOURS OF LABOR OF FEMALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — CONTINUED.

OCCUPATIONS, BASES OF PAYMENT, AND YEARS.	Number of Establishments	Number of Adult Female Metal Workers	Average Flat Rate per Hour (Time-Workers)	ACTUAL EARNINGS		Average Actual Hours of Labor
				Average per Hour	Average per Week	
Drillers.						
Time-workers:						
1916,	2	20	$0.140	$0.140	$6.64	48.0
1917,	3	28	.154	.154	7.66	50.1
1918,	5	62	.242	.253	7.82	31.0
1919,	4	25	.318	.320	14.10	43.9
Piece-workers:						
1916,	2	17	-	.254	12.14	47.8
1917,	4	25	-	.288	12.09	42.0
1918,	6	109	-	.309	11.66	37.7
1919,	4	43	-	.408	17.40	42.6
Piece and time-workers:						
1916,	1	7	.100	.229	9.79	42.6
Finishers (Surface Coaters).						
Time-workers:						
1916,	1	5	.150	.153	8.00	52.5
1917,	1	3	.150	.150	7.34	48.9
1918,	3	4	.218	.238	11.74	49.3
1919,	2	22	.258	.258	11.94	46.1
Piece-workers:						
1916,	1	2	-	.212	9.15	43.0
1917,	2	9	-	.260	11.80	45.4
1918,	2	20	-	.386	18.70	48.4
1919,	4	16	-	.483	21.19	43.8
Piece and time-workers:						
1917,	1	2	.170	.193	9.43	48.8
Foundry Workers, n. e. s.						
Time-workers:						
1915,	1	10	.111	.111	5.65	50.8
1916,	1	7	.141	.148	8.25	55.7
1917,	1	5	.152	.171	8.42	49.2
1918,	2	14	.224	.232	9.41	40.6
1919,	3	13	.291	.292	13.13	45.0
Piece-workers:						
1914,	1	1	-	.219	8.59	39.3
1915,	1	1	-	.160	7.82	49.0
1916,	1	8	-	.202	9.74	48.3
1917,	2	7	-	.264	13.09	49.6
1918,	1	5	-	.295	11.92	40.4
1919,	1	2	-	.309	14.84	48.0
Piece and time-workers:						
1914,	1	1	.120	.138	5.40	39.3
1915,	1	4	.115	.161	8.31	51.5
1916,	1	1	.140	.216	11.45	53.0
1919,	1	1	.280	.290	13.92	48.0
Forewomen.						
Time-workers:						
1914,	1	1	.225	.225	9.00	40.0
1916,	4	9	.231	.231	12.39	53.6
1917,	5	13	.277	.291	15.76	54.0
1918,	5	14	.371	.394	17.38	44.1
1919,	3	5	.464	.467	22.45	48.0
Piece and time-workers:						
1915,	1	1	.225	.225	12.05	54.0

TABLE B. — AVERAGE EARNINGS AND HOURS OF LABOR OF FEMALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — CONTINUED.

OCCUPATIONS, BASES OF PAYMENT, AND YEARS.	Number of Establishments	Number of Adult Female Metal Workers	Average Flat Rate per Hour (Time-Workers)	ACTUAL EARNINGS		Average Actual Hours of Labor
				Average per Hour	Average per Week	
Grinders.						
Time-workers:						
1916,	1	1	$0.170	$0.170	$8.97	52.8
1917,	1	17	.182	.193	8.66	45.0
1918,	3	29	.262	.280	13.35	47.7
1919,	1	2	.315	.315	14.63	46.5
Piece-workers:						
1916,	1	1	–	.204	9.80	48.0
1917,	1	1	–	.197	9.69	49.0
1918,	3	21	–	.390	17.77	45.5
Helpers and Apprentices.						
Time-workers:						
1914,	1	1	.110	.110	4.32	39.3
1915,	1	12	.175	.175	7.57	43.3
1916,	3	5	.142	.142	6.79	47.7
1917,	2	13	.208	.208	9.75	46.9
1918,	6	46	.265	.286	13.50	47.2
1919,	4	12	.285	.291	12.17	41.8
Piece-workers:						
1915,	1	2	–	.195	10.20	52.3
1916,	1	1	–	.232	11.62	50.0
1917,	1	2	–	.262	12.48	47.7
1919,	3	66	–	.410	18.18	44.3
Inspectors.						
Time-workers:						
1914,	3	19	.153	.153	6.27	40.9
1915,	3	22	.168	.168	8.67	51.7
1916,	4	78	.168	.168	7.75	46.5
1917,	5	180	.193	.193	8.89	46.1
1918,	10	672	.258	.268	10.16	37.8
1919,	7	144	.300	.312	14.03	45.0
Piece-workers:						
1915,	1	1	–	.187	7.50	40.0
1916,	1	7	–	.280	10.81	38.7
1917,	1	9	–	.242	10.63	43.9
1918,	3	3	–	.265	12.08	45.7
1919,	3	9	–	.561	21.74	38.8
Piece and time-workers:						
1916,	1	4	.180	.229	8.40	36.8
1917,	1	1	.200	.259	12.45	48.0
1919,	1	1	.290	.374	17.93	48.0
Lathe Hands.						
Time-workers:						
1916,	1	3	.141	.141	6.44	45.7
1917,	1	11	.179	.179	8.19	45.7
1918,	6	55	.287	.315	13.26	42.1
1919,	5	14	.299	.301	12.98	43.1
Piece-workers:						
1916,	1	5	–	.172	9.28	54.0
1917,	3	9	–	.287	13.73	47.8
1918,	5	26	–	.438	20.49	46.8
1919,	6	15	–	.426	17.80	41.8
Piece, and time-workers:						
1918,	1	5	.280	.548	27.76	50.7

TABLE B. — AVERAGE EARNINGS AND HOURS OF LABOR OF FEMALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — Continued.

Occupations, Bases of Payment, and Years.	Number of Establishments	Number of Adult Female Metal Workers	Average Flat Rate per Hour (Time-Workers)	Actual Earnings		Average Actual Hours of Labor.
				Average per Hour	Average per Week	
Machine Operators, Automatic.						
Time-workers:						
1917,	1	1	$0.200	$0.200	$4.80	24.0
1918,	1	67	.284	.286	10.03	35.0
Piece-workers:						
1917,	1	6	-	.261	13.38	51.3
1918,	2	4	-	.471	18.19	38.6
Piece and time-workers:						
1917,	1	2	.200	.245	11.76	48.0
1918,	1	10	.300	.431	18.27	42.4
Machine Operators, n. e. s.						
Time-workers:						
1916,	4	12	.158	.158	7.00	44.2
1917,	5	37	.208	.220	8.59	39.0
1918,	6	44	.252	.275	11.44	41.6
1919,	5	26	.293	.295	13.42	45.6
Piece-workers:						
1914,	3	12	-	.198	7.50	37.8
1915,	3	17	-	.153	8.84	57.6
1916,	3	43	-	.232	10.76	46.4
1917,	4	67	-	.265	11.78	44.5
1918,	9	61	-	.405	17.58	43.3
1919,	7	33	-	.441	19.31	43.8
Piece and time-workers:						
1916,	1	8	.100	.202	9.93	49.2
1917,	2	15	.200	.221	9.66	43.7
1918,	1	2	.240	.311	14.10	45.3
1919,	1	5	.324	.394	18.91	48.0
Polishers.						
Time-workers:						
1918,	2	18	.239	.258	10.86	42.1
1919,	2	6	.270	.276	13.05	47.3
Piece-workers:						
1918,	2	5	-	.339	14.14	41.7
1919,	1	2	-	.466	18.43	39.5
Press Operators.						
Time-workers:						
1917,	1	1	.150	.150	8.10	54.0
1918,	2	6	.233	.243	11.36	46.7
Piece-workers:						
1914,	1	6	-	.200	8.00	40.0
1915,	1	8	-	.184	9.49	51.7
1916,	1	6	-	.212	10.23	48.2
1917,	2	30	-	.278	12.74	45.8
1918,	2	36	-	.365	15.88	43.5
1919,	2	49	-	.399	16.20	40.6
Piece and time-workers:						
1915,	1	1	.100	.152	8.15	54.0
Testers.						
Time-workers:						
1914,	1	2	.150	.150	4.50	30.0
1915,	1	1	.200	.200	11.00	55.0
1916,	2	8	.188	.191	5.66	29.6
1917,	2	9	.233	.235	10.75	45.8
1918,	2	27	.315	.336	13.76	41.0
1919,	2	29	.410	.410	14.45	35.2

TABLE B. — AVERAGE EARNINGS AND HOURS OF LABOR OF FEMALE METAL WORKERS, 18 YEARS OF AGE AND OVER, IN SELECTED OCCUPATIONS, FOR A CORRESPONDING WEEK IN EACH SPECIFIED YEAR, 1914–1919 — CONCLUDED.

OCCUPATIONS, BASES OF PAYMENT, AND YEARS.	Number of Establishments	Number of Adult Female Metal Workers	Average Flat Rate per Hour (Time-Workers)	ACTUAL EARNINGS		Average Actual Hours of Labor
				Average per Hour	Average per Week	
Testers — Con.						
Piece-workers:						
1914,	1	2	–	$0.182	$5.65	31.0
1916,	1	1	–	.206	9.70	47.0
1917,	1	6	–	.277	11.71	42.3
1919,	1	1	–	.379	18.21	48.0
Piece and time-workers:						
1915,	1	1	$0.100	.192	10.40	54.0
1917,	1	1	.200	.301	14.73	49.0
Winders.						
Time-workers:						
1914,	1	1	.175	.175	7.00	40.0
1915,	2	14	.193	.197	7.25	36.8
1916,	2	11	.164	.182	6.55	36.0
1917,	2	17	.241	.246	11.73	47.7
1918,	2	36	.258	.282	11.52	40.8
1919,	2	36	.212	.212	10.34	48.9
Piece-workers:						
1914,	1	42	–	.192	7.46	39.0
1915,	2	96	–	.202	8.94	44.3
1916,	2	125	–	.228	9.42	41.4
1917,	2	216	–	.282	12.25	43.5
1918,	2	154	–	.408	18.94	46.5
1919,	2	174	–	.408	18.21	44.6
Piece and time-workers:						
1914,	1	2	.115	.138	5.50	40.0
1915,	1	39	.172	.202	9.66	47.9
1916,	2	2	.140	.217	7.24	33.4
1917,	1	10	.160	.168	7.25	43.2
1918,	1	1	.240	.247	12.77	51.5
Other Occupations.						
Time-workers:						
1915,	1	1	.150	.150	8.25	55.0
1916,	2	9	.156	.156	8.23	52.7
1917,	1	6	.267	.290	14.87	51.3
1918,	6	25	.288	.310	12.70	40.9
1919,	6	28	.320	.320	14.98	46.7
Piece-workers:						
1914,	1	2	–	.211	8.43	40.0
1915,	1	1	–	.188	10.10	53.8
1916,	1	1	–	.493	21.64	44.0
1917,	2	86	–	.328	14.30	43.5
1918,	4	106	–	.384	17.26	44.9
1919,	2	90	–	.430	19.02	44.2
Piece and time-workers:						
1916,	1	1	.200	.203	10.50	51.8

VIII.

SPECIMEN FORM OF SCHEDULE USED IN THE INVESTIGATION.

[L-55]

CONFIDENTIAL

IDENTIFICATION No.....

The Commonwealth of Massachusetts

BUREAU OF STATISTICS[1]

LABOR DIVISION[1]

CHARLES F. GETTEMY[1]
DIRECTOR

RATES OF WAGES, EARNINGS, AND HOURS OF LABOR

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1. City or town,............... 2. Industry,.......... 3. Specific product,.........

4. Normal working hours (exclusive of meal periods):

a. Monday to Friday,.... *b.* Saturday,.......... *c.* Total hours per week,.....

5. Facts called for below should be for the week ending.............................191

Department and Occupation. NOTE: — Those earning the *same* amount may be grouped together; otherwise each entry should represent only one person.	Time-Workers (T) or Piece-Workers (P)	Number of Employees				Regular Time			Overtime			Total Earnings, Regular and Overtime	Remarks
				Minors (under 18 years)									
		Men	Women	Males	Females	Number of Hours Worked	Rate per Hour* for Regular Time	Earnings for Regular Time	Number of Hours Worked	Rate per Hour* for Overtime	Earnings for Overtime		
1..........................	......	....	....	....	....	......	$.....	$...	......	$.....	$....	$....	....
2..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
3..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
4..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
5..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
6..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
7..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
8..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
9..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
10..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
11..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
12..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
13..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
14..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....
15..........................	......	....	....	....	....	......	.....	.....	......	.....	.....	.....	....

* If the unit of payment is by the day, week, or month, so specify, and enter rate.

[1] See note 1 at foot of page 5.

The Commonwealth of Massachusetts

DEPARTMENT OF LABOR AND INDUSTRIES

PUBLICATIONS OF THE DIVISION OF STATISTICS.

[The Division of Statistics, as now organized, will continue to issue the following reports which formerly were issued by the Massachusetts Bureau of Statistics, certain of the functions of which Bureau were transferred on December 1, 1919, to the Department of Labor and Industries. A descriptive list of the publications issued by the Bureau of Statistics prior to the transfer of its functions to other departments will be furnished on application.]

I. REPORT ON THE STATISTICS OF LABOR.

(Public Document No. 15.)

The first Annual Report on the Statistics of Labor was published in 1870, the first Labor Bulletin in 1897, and Special Reports were issued from time to time as occasion required. Beginning with the year 1913 all of these several publications, except the "Quarterly Reports on Employment," have been styled "Labor Bulletins," and a certain number of copies have been set aside for binding and publication at the end of the year under the title of the "Annual Report on the Statistics of Labor." The Labor Bulletins are numbered consecutively as issued, and each number contains matter devoted to one subject, concerning labor or the condition of the wage-earning population or questions of economic or social interest.

A list of Bulletins issued since 1918 will be found below, any of which will be mailed to applicants upon request. Persons or organizations desiring to receive the Labor Bulletins as issued will be entered on the mailing list upon making application.

(A list of the Reports and Bulletins issued prior to 1919 will be furnished on application.)

No. 127, May, 1919. Eighteenth Annual Directory of Labor Organizations in Massachusetts, 1919.
No. 128, October, 1919. Union Scale of Wages and Hours of Labor in Massachusetts, 1918.
No. 129, November, 1919. Labor Legislation in Massachusetts, 1915 to 1919, inclusive.
No. 130, May, 1920. Nineteenth Annual Directory of Labor Organizations in Massachusetts, 1920.
No. 131, July, 1920. Union Scale of Wages and Hours of Labor in Massachusetts, 1919.
No. 132, September, 1920. Wages and Hours of Labor in the Metal Trades in Massachusetts, 1914–1919.

II. REPORT ON THE STATISTICS OF MANUFACTURES.

(Public Document No. 36.)

The first Annual Report on the Statistics of Manufactures was published in 1886. Each report issued prior to 1907 contained comparisons for identical establishments, between two or more years, as to Capital Devoted to Production, Stock and Materials Used, Goods Made, Persons Employed, Wages Paid, and Time in Operation. Beginning with 1907 the comparisons for identical establishments were omitted, and all returns made to the Bureau were included in the tabulations. The Thirty-third Annual Report covering the year 1919 is now being compiled.

III. REPORT ON THE PUBLIC EMPLOYMENT OFFICES.

(Public Document No. 80.)

The first Annual Report on the State Public Employment Offices was published in 1907. The annual reports contain statistical tables and descriptive matter relative to the work of the offices, and, with the exception of the 1st and 4th (out of print), will be sent upon application. The Thirteenth Annual Report for the calendar year, 1919, is available for distribution.

IV. MASSACHUSETTS INDUSTRIAL REVIEW.

This quarterly publication supersedes the "Quarterly Report on Employment in Massachusetts" which was published by the Massachusetts Bureau of Statistics during the years 1908 to 1919, inclusive. The Review includes the usual quarterly statistics relative to employment, the operations of the State Public Employment Offices, building operations in Massachusetts, industrial disputes, and brief articles with reference to matters of current interest to employers and employees, and furnishes a medium for the early publication of data obtained in connection with various investigations, the results of which are to be published later in greater detail. The first issue of this Review was for March, 1920 (out of print). Nos. 2 and 3 for June, 1920 and October, 1920, respectively, are available for distribution.

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